Agricultural Research Institute

PUSA

JOURNAL

OF THE

NEW YORK

ENTOMOLOGICAL SOCIETY

Devoted to Entomology in General

Volume XXI, 1913

NEW YORK
PUBLISHED BY THE SOCIETY
QUARTERLY
1913

PRESS OF
THE NEW ERA PRINTING COMPANY
LANCASTER, PA.

CONTENTS OF VOLUME XXI.

JOURNAL

OF THE

New York Entomological Society.

Vol. XXI. MARCH, 1913. No. 1.

FACTORS IN AQUATIC ENVIRONMENTS.[1]

By Frank E. Lutz,

New York, N. Y.

There is little in nature which is hard and fast; few distinctions are clear-cut. Therefore, in a study of environments we must not expect to be able to draw definite lines even at the most evident boundaries. On first thought it would seem easy to classify environments into aquatic and terrestrial, but, not only are some animals distinctly aquatic at one stage of their existence and just as distinctly terrestrial at some other, but certain situations such as the mud along a pond's edge are intermediate in more senses than one between water and land.

Considering the former difficulty, we find that whenever an insect has both terrestrial and aquatic stages, the larval condition is always aquatic. The terrestrial stage, the adult stage, is used merely for the perpetuation and spread of the species. In fact, it will greatly simplify matters throughout the study of the relations of insects to physical environments if we keep in mind that the presence or absence of the environment suited to the immature stages determines the presence or absence of the species much more than does an environment especially suited to the adult.

For the most part, but not exclusively so, aquatic animals are

[1] During the past winter the N. Y. Ent. Society has been conducting a series of symposia upon the Relations of Insects to their Environment. The papers on Aquatic Insects published here were given at the first symposium of this series.

primitive and primitive animals are aquatic. Among the invertebrates, with the exception of the dubious Mycetozoa, all the Protozoa spend the active part of their lives in fluid surroundings; sponges, jelly-fishes and their allies, star-fishes and their allies, and most worms are aquatic; while only the higher arthropods are at all terrrestrial. Among the vertebrates, on the other hand, only the most primitive, the fishes, are typically aquatic, the vast majority being terrestrial. Returning to the invertebrates and considering the insects, we find that low in the scale whole orders—Plecoptera, Trichoptera, Odonata, and so on—have exclusively aquatic larvæ. Here again the distinctions are not clear cut. The Thysanura are not aquatic and the Isoptera are also both terrestrial and primitive, but, in general, there seems to be at least the shadow of a rule.

Even when we consider the higher orders, we find that the aquatic Diptera, Coleoptera and Hemiptera are the more primitive members of their respective orders while aquatic Hymenoptera are exceedingly rare. The Orthoptera come in to disturb us by being both primitive and terrestrial but here also the more nearly aquatic, the now distinct order of earwigs and certain of the cockroaches, are the more primitive.

All this may seem foreign to the purposes of our symposia. Still it seemed to me interesting to note that in a very general way the division into aquatic and terrestrial insects is also a division into primitive and modern. The division is not distinct but it is probably as distinct as most of those we will be able to draw. Admitting it, the question of cause now looms large as it always should. The answer that would be given by most theorizers is that life originated in the water and that our present day aquatic fauna is a survival of the early origins. Nevertheless, the very most primitive insects are very far removed indeed from the origin of life. I suspect that a better reason may be that in early times certain insects took to the water and that aquatic environments, although variable, are less variable than terrestrial and have therefore not given rise to a series of modifications resulting in great changes from the primitive types.

Consider the factors of the aquatic environments as contrasted with terrestrial. There is no variation in *absolute* humidity since water is always as wet as it can be. There is, however, a variation in physiological humidity. That is, when the water contains certain

salts, as does the ocean, or certain acids, such as the humic acids of peat bogs, the water is not fully available for organic life. In fact, if an insect larva be taken from a brook and put in a brackish pool it will actually lose water through its skin; it will partly dry up. However, peat bogs and salt meadows make up only a small part of the homes of aquatic insects. In large part we can say that there is no variation in even the physiological humidity of aquatic environments. The humidity of terrestrial environments, on the other hand, varies every few feet.

The temperature is also more constant in aquatic environments than in terrestrial, although it is somewhat variable from place to place and month to month. In the summer, a spring hole is cooler than a rainwater puddle and the opposite is apt to be true in the winter. In general, a running stream is apt to be cooler in summer than a stagnant one. In the spring a deep pond is generally cooler than a shallow one and the opposite is true in the autumn. But aquatic insects are never subject to the sharp daily fluctuations of temperature that most of their terrestrial relatives must bear, and even the annual range of temperature variations are slight. Admitting all this, it may still be true that such differences as there are among the various aquatic abodes have an influence in determining the kinds of insects to be found there.

The variation of light is probably more nearly equal in the two major environmental divisions, although, since the light is never so intense below the surface as above and since it can never be darker than the absolute darkness of a terrestrial insect's burrow, aquatic environments are probably more uniform with respect to this factor also.

There is one important factor which varies more among aquatic environments than among terrestrial ones. This is the oxygen. Now to be of influence in modifying form or distribution, a factor must be both important and variable. Oxygen is undoubtedly important for all insects, but since it is not subject to a great deal of variation in truly terrestrial environments, it can be neglected there as far as these problems are concerned. We would not expect this to be true in the aquatic and indeed we find that not only is the fauna of well aerated mountain brooks very distinct as to its species from that of the pools along its edge, but we note that the most striking modifica-

tions of aquatic insects are concerned with the respiratory system.

Current is an important factor of aquatic environments which finds its terrestrial counterpart in winds. That it is a very important factor is shown by the numerous devices aquatic insects have to keep their position and it varies from nothing in puddles to the rush of Niagara.

Food is a factor which is always both important and variable. It is, however, a secondary factor in that, whatever the food habits of the insects may be, the analysis always leads us back to plants which have their own primary relations to the organic factors of the environment.

Enemies are also important and variable. The abundance or absence of fish in a pool will go a long way toward deciding whether mosquitoes will breed there or not.

Summarizing the factors of aquatic environments with respect to their effects upon the distribution of insects: Humidity is important only in the case of salty water and where there is a great decay of humus as in peat bogs. Temperature is probably only slightly more important. Light is probably important chiefly on account of its influence upon vegetation, hence food. Oxygen would seem to be of great direct importance. It should be noted in this connection, however, that many of the insects which live in the water breathe atmospheric air. Finally, among the inorganic factors current is not only of direct importance but has an additional indirect effect through its influence upon the oxygen content of the water. The organic factors of food and enemies are, of course, of prime importance.

RELATIONS OF TRICHOPTERA TO THEIR ENVIRONMENT.

By CHAS. E. SLEIGHT,

RAMSEY, N. J.

Trichoptera are almost exclusively confined to aquatic environments during the larval and pupal stages. The larvæ of one species of Limnephilidæ is reported to live in mosses at the roots of trees but the group as a whole is typically aquatic. As far as I know,

with but very few exceptions, they are confined to fresh water and are rarely, if ever, to be found in any but permanent fresh water bodies.

The larvæ of Trichoptera have the extremely interesting habit of protecting themselves by building some sort of a case in which to live. Their cases are of a great variety of form and structure, as will be pointed out later. Those larvæ which live in very swift streams usually fasten their cases to stones by means of silken threads. In the more quiet waters the larvæ crawl from place to place, dragging their cases with them. Pupation takes place in the larval case. When it is time for the adult to emerge, the pupæ come to the surface either by crawling or by swimming with their middle pair of legs. The middle legs of the pupæ possess hairs adapting them to this use.

It is very interesting to watch some of the Hydropsychids, which live in swift streams emerge. As soon as the pupa reaches the surface its skin splits down the back and the adult flies away, leaving the skin on the surface of the water. It is almost as though the pupa swam to the surface and immediately flew. For the most part the pupæ of those species which live in ponds and slow flowing streams, crawl to the surface or beyond and the adult takes some time to dry its wings before flying.

With the possible exception of the Hydropsychidæ, the larvæ seem to be vegetarians, many of them feeding on the slime and decaying leaves found on the bottom. Even some of these will not refuse pieces of meat and it is believed that the net-building *Hydropsyche* at least are almost entirely carnivorous. The adults have rudimentary mouthparts and as far as is known they do not feed.

Usually both larvæ and pupæ breathe by means of tracheal gills. Some, however, lack gills and breathe through the skin. In my opinion there is little relation between distribution and the amount of oxygen in the water, as is indicated by the following experiments:

It has been pointed out that swift streams tend to be well supplied with oxygen and there is a general feeling that animals from such environment are difficult to rear in ordinary aquaria. However, I have kept even a net-building *Hydropsyche* for a week or more in mason jars.

In June last I also transferred about 50 of the snail-shell-like cases (*Helicopsyche annulicornis* Banks) from swift water to a

quart jar and after about two weeks adults emerged from most of them. Some of these adults mated, laid eggs, and larvæ are now living (Jan., 1913) in a small dish containing less than one gill of water, which is merely renewed, never changed.

There is, however, a rather definite relation between the distribution of Trichoptera and the speed of the current, as is shown by the accompanying cut. The vertical divisions indicate the relative speed of the current and the black areas show the conditions in which the various cases (selected as typical forms) are found. The widths of the areas give an approximate idea of the relative abundance of the respective species in the various environments. Probably further study will make some changes in this diagram necessary, but I believe that it is correct in a general way at least. The upper case is that of a net-building *Hydropsyche;* it is typically found only in very strong currents but occasionally it does occur where the flow is not so rapid. They usually build their cases of sand or small pebbles, cemented together with silk and fastened on or between stones. The larvæ are very active, they are able to crawl over the stones and cling fast with their long pro-legs which are provided with strong hooks. The entrance of the case opens into a net with a canopy over it, built of very small pieces of twigs and leaves. The opening of the net faces the current. The pupa, upon leaving the case, crawls over the bottom for a short time, then shoots to the surface, where it immediately sheds its skin and takes flight. I have witnessed this a number of times. They undoubtedly obtain their food by means of the net.

The next species shown occurs with the net builder. It builds loose cases of small pebbles between or on stones in rapidly flowing water.

The next three species are found in water which has a fairly strong current but they do not occur in the swiftest streams where the two previously mentioned are at home. The larvæ do not fasten down their cases as do the two above mentioned.

The case of *Halcsus argus* Harr. (the large one in the middle) consists of a tough inner portion surrounded by heavy water-soaked twigs and pieces of bark. The immature larvæ occasionally use pebbles also and those about to pupate normally do.

The cases of the other two species are made of sand and pebbles.

The lower (*Helicopsyche annulicornis* Banks) is formed of fine grains of sand of uniform size, cemented together with silk into the shape of a snail shell. As a matter of fact, it is said to have been described as a species of snail. The pupal cases are found attached to sticks, stones, and cases of larger Trichoptera.

The fifth species (*Psilotreta frontalis* Banks), found all the way from rather swift current to nearly still water, although quite common about Ramsey, is not recorded in Smith's list, nor even the family Odontoceridæ to which it belongs. The cases are made of small uniform grains of sand.

The next species is usually found in places having slightly less current, but never in absolutely still water. Their cases are somewhat similar to the previous one, although they taper more at the posterior end and are made of finer sand.

The wide flat sand case (*Molanna cinerea* Hagen) comes next in the series. It is not to be found in absolutely still water, although it does not occur where the current is even moderately strong.

The branched case is very different from the usual type of Trichoptera cases. There are several species differing slightly among themselves, but all apparently belonging to the genus *Polycentropus*. All but the upper tips of the cases are buried in the mud or sand. For the most part they are found where there is a very slight current, but they extend their distribution even up to the strong current and down to the absolutely still water. Those in the slight current of streams are built of sand, while those in the still water of ponds use very fine pieces of vegetable matter. The cases of some species are straight, others are branched as shown; some are of uniform diameter while others have enlargements, forming cells in which the larva rests, but all are imbedded in the bottom. Where the mud is deep the cases are much longer than where there is little or no mud.

We come now to those species which are typical of absolutely still water. The first, *Platycentropus maculipennis* Kolen. = *Halesus hostis* Hagen, it is true, occurs all the way up to rather strong current, but it becomes more abundant as the strength of the current decreases. Its case is made of bits of leaves—duck-weed being frequently used.

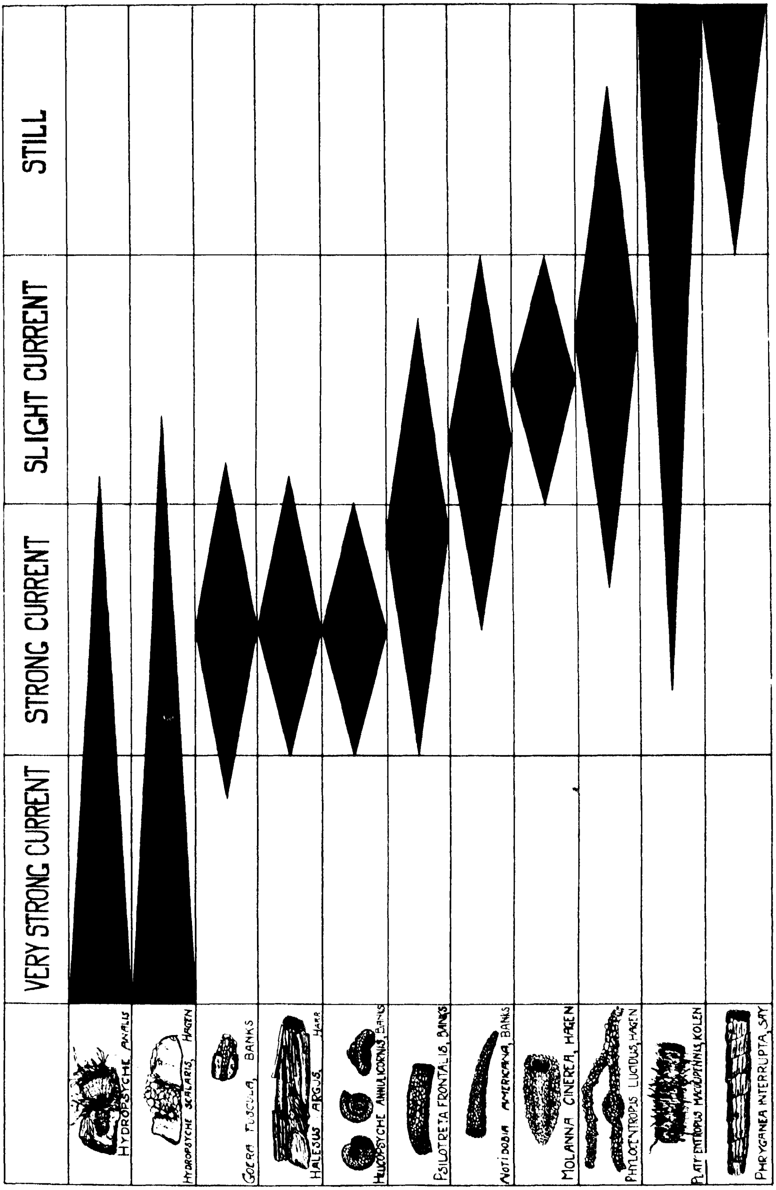
The last (*Phryganea interrupta* Say) is found only in still water. The cases are smooth cylinders formed of pieces of leaves. The

pupæ are usually to be found in protected situations. I have found them most often imbedded in soft wood under the bark of decayed logs. As many as twenty-five cases were taken in a piece of white birch 2½ in. in diameter by 6 in. long.

It will be noted that as far as this material goes and it may be considered typical, the first two species, namely those which live in the most rapid streams, are the only ones among those having exposed cases which firmly anchor their larval cases. The last two, namely those characteristic of still water, are also the two which build their cases of the lightest, most easily floated material. The species of *Polycentropus* build in the mud or sand of the bottom and since there is more loose material, mud, etc., to be found where the current is weakest and since the exposed tips of the cases would be liable to be broken in the swift current, they find their best home in water having slight or no motion. In other words, I believe that the distribution of the larvæ of Trichoptera is strongly influenced by the adaptation of their cases to the strength of the current.

Of course, other factors have influence, but they do not seem to be as important as the strength of the current. As an example of the way these other factors work, it might be noted that although *Platycentropus maculipennis* is typically found in still water, it occurs in even a strong current if there be an abundance of vegetation to which it can cling.

As another example, *Molanna cinerea* Hagen is found only where there is slimy ooze on the bottom, but it is not found where there is a slimy ooze if there is no current or if the current be at all strong. As a matter of fact, we can, by a glance at Fig. —, make a fairly safe prediction as to which of these species will be found in a given environment—that is, a given environment in northern New Jersey.



Trichoptera

ODONATA IN RELATION TO THE HYDROPHYTIC ENVIRONMENT.

BY RAYMOND C. OSBURN,

NEW YORK, N. Y.

All species of dragonflies are aquatic in the larval stage, and therefore, the Odonata as a group belongs to the fauna of the hydrophytic area.

The eggs are deposited in the water, either by the process of "dipping," by which the eggs are washed from the tip of the abdomen of the female, or, in some cases, the female rests with the tip of the abdomen beneath the surface of the water while the eggs are being laid. In the latter case, the eggs are usually deposited singly in incisions made in the stems of aquatic plants by means of the genital valves. In other cases the eggs fall to the bottom singly, as a rule, though the species of *Tetragoneuria* and *Epitheca* deposit an egg-mass in the form of a gelatinous string. A few of the tropical species lay eggs in water caught in the cups formed by the leaves of Bromeliads. The time required for hatching varies from a few days to several weeks, depending upon the temperature of the water, and the young larvæ emerge to begin their aquatic life. They are predaceous, feeding upon various kinds of aquatic animals, chiefly other insects which they capture by means of the peculiar extensile labium. The larger larvæ often devour young fishes, tadpoles and even smaller individuals of their own species.

Two distinct types of respiration are represented among the dragonfly larvæ. In the small species known as demoiselles (sub-order Zygoptera) there are thin, flattened, leaf-like, terminal appendages of the abdomen which are adapted to the absorption of oxygen from the water. In the larger, more robust forms, dragonflies (sub-order Anisoptera), a unique method of respiration has been evolved. The rectum is greatly expanded, the walls convoluted to form a system of gills in which there are thousands of tracheal endings. By rhythmic pulsations the water is alternately drawn in and expelled from the rectum, and the rectal gills serve to extract the oxygen from the water. This same apparatus also serves as a locomotor organ in swimming by the members of this same group. Forcible expulsion

of the water serves to drive the larva forward in the water, a method of swimming found otherwise in jellyfishes, cephalopods and salps. The larvæ of the demoiselles swim by an undulatory movement of the body.

The habits of the larvæ vary considerably. Those of the demoiselles and certain of the larger forms, especially of the Æshninæ, climb about among water plants, and such forms are usually green-colored as a protective adaptation. The larvæ of the Gomphinæ and Libellulinæ wander over the bottom, or partially or entirely bury themselves in the mud and muck. These are brownish or gray, neutral-colored forms and are usually covered more or less by particles of the debris among which they live. Many species are widely distributed and are found in almost all sorts of localities, appearing to have no special choice as to whether they inhabit streams or ponds. Other species, again, are limited to particular habitats, such as spring-fed brooks, rapid creeks or stagnant ponds and marshes. Some of the species mature in a year, others, it is said, spend as long as three years in the larval condition.

Numerous species are known to breed in brackish water, and, as the writer has shown (American Naturalist, Vol. XL, June, 1906, pp. 395–9), they are capable of withstanding a salinity equal to about half that of pure sea-water. Schwarz ("Preliminary Remarks on the Insect Fauna of the Great Salt Lake, Utah," Canadian Entomologist, Vol. XXIII) has also recorded certain species as inhabiting salt and sulphurous ponds in Utah, and the writer has observed others in slightly alkaline ponds in North Dakota. These same species breed also in pure fresh water and some of them are distributed from coast to coast. Two species, *Erythrodiplax berenice* and *Ischnura ramburii*, are restricted to a coastwise distribution along the Atlantic and Gulf of Mexico. The exact reasons why these forms that may breed in brackish water are unable to breed in water having a higher salinity, such as pure sea-water, has not been determined.

Before the time of transformation the larvæ often crawl out of the water for brief periods, breathing by means of the spiracles, and when the time has arrived for shedding the larval skin the insect crawls out upon the bank or upon a stick or waterplant projecting above the surface, splits down the back of the thorax and emerges in the winged condition. The adults of the larger species are, as a rule, strong

fliers and often range very widely from their breeding places. Especially is this true of the females, which may often be found far away coursing through the woods, along the roads, or over fields in search of food. The male will often patrol a selected reach of stream or area of a pond, viciously attacking any other male of his own or another species which happens to wander into his chosen territory.

Libellula pulchella and *Plathemys trimaculata* are much given to perching on sticks, cat-tails and in other exposed situations in the bright sunlight. Gomphines are most frequently seen when at rest, perched upon stones or upon the dry banks of streams or ponds. Some strong flying species, such as *Anax junius* and the Æshnas are seldom seen at rest in the daytime, and often continue their search for prey during the twilight hour, though a crepuscular habit is not common to the group.

Boyeria vinosa is usually found in shaded situations along streams, and the *Somatochloras* frequently wander far into the forests. The small Libellulines, *Perithemis domitia* and *Nannothemis bella* seldom are found very far from the lily-pads and the open water at the edge of pools and lakes. On the other hand the species of *Sympetrum*, a related genus, range far afield.

The small, thin-bodied demoiselles usually do not wander far and generally fly low among the grasses and weeds, or hover close over or rest upon the lily-pads and floating vegetation of the marshes. The species of *Agrion* (*Calopteryx*) are fond of shady places along the creeks and springs.

Notes on the habits and occurrence of our local species are given by Mr. Wm. T. Davis in the paper which follows this.

DRAGONFLIES OF THE VICINITY OF NEW YORK CITY WITH A DESCRIPTION OF A NEW SPECIES.

BY WM. T. DAVIS,

NEW BRIGHTON, STATEN ISLAND.

In this JOURNAL for March, 1895, Dr. Philip P. Calvert published a list of "The Odonata of New York State," and in the June, 1897, number, appeared his "Additions to the Odonata of New York State."

Also in this JOURNAL for September, 1898, appeared a "Preliminary List of the Dragonflies of Staten Island, with notes and Dates of Capture," by the present author. The information contained in these publications, together with the last edition of the New Jersey list, and much unrecorded material gathered in recent years has formed the basis of the present list, which numbers one hundred and seventeen species. The author has personally taken all but seven of the species at localities here recorded. He has been presented with four of the others by their captors; has examined two in collections, leaving but one species to be added from the literature alone. Only four records have been taken from Dr. Calvert's New York lists, as most of his material came from localities further up the state. Following these and other copied records, the collector's name is given in parenthesis.

The New Jersey list enumerates one hundred and nine species and the present list will add nine, including a new species, to the number known to occur in that state, all but three belonging to the Agrionidæ. Several species are also added to the New York list. *Ischnura kellicotti* has, according to the New Jersey list, been found in Ocean and Atlantic counties, but it will certainly be collected nearer to New York City than at present recorded.

To Prof. Raymond C. Osburn I am indebted for the suggestion that I prepare the present list to include the species taken at localities within about fifty miles of New York City, and also for much help in connection with the new species. Mr. Lewis B. Woodruff has kindly given me a list of his captures, many of which were made in Westchester Co., N. Y.; Mr. George P. Engelhardt, of the Children's Museum of the Brooklyn Institute of Arts and Sciences, has let me go over his material, and Mr. Frank E. Watson has added to my collestion from time to time such species as attracted his attention while in quest of butterflies. This information, together with one or two other records from friends, is in each case followed by the name of the contributor. When no name is given the records have been taken from material in the author's collection.

In the matter of classification the recent "Catalogue of the Odonata of North America," by Richard A. Muttkowski, has been followed.

Family AGRIONIDÆ.

Genus AGRION Fabricius.

A. maculatum Beauvois.

Common along brooks in June, July and August, and generally distributed. This dragonfly will fly from a twig or low plant by the brook side, catch a tiny insect and return to the same station again. They often come back to the same resting place many times in succession where they remain until some small insect attracts their attention and they sally forth to catch it. In this respect they resemble the insect-catching phœbe bird and its relatives. Though usually a slow flyer this species often indulges, when two males happen to meet, in a very rapid aerial dance and at such times their bright colors show to the best avantage. They will advance against each other, dodge or recede, with remarkable rapidity and grace, but neither of the combatants ever appears to be injured. It seems to be more of an endurance test.

A. æquabile Say.

Bronx Park, N. Y. City, VI, 3; Newfoundland, N. J., V, 6, and Great Notch, N. J., V, 30 (Davis); Long Island, VIII, 12 (Engelhardt). This is an addition to the New Jersey list.

A. dimidiatum apicale Burmeister.

Jamesburg, N. J., VII; Lakehurst, N. J., VI, VII. At the last mentioned locality it is often quite common flying up and down the larger ditches in the cranberry bogs.

Genus HETÆRINA Hagen.

H. americana Fabricius.

Collected at Paterson, N. J., in September by John A. Grossbeck. It has also been taken in Morris Co., N. J., by Dr. Calvert (N. J. list). When found at all, it is usually present in considerable numbers and flies up and down ditches and along the banks of slow flowing rivers.

Genus LESTES Leach.

L. eurinus Say.

It has been taken on two occasions, June 18 and July 4 about a small tree shaded pond on Staten Island. Riverdale, N. Y., VII (Woodruff).

L. congener Hagen.

Bronxville, N. Y., VII, VIII (Woodruff); Flushing, N. Y., VIII; Staten Island, IX, X, XI; Lakehurst, N. J., X. This and the other species of *Lestes* are to be found about ponds and ditches.

L. unguiculatus Hagen.

Newfoundland, N. J., VII; Bronxville N. Y., VI, VII (Woodruff); Yaphank, N. Y., IX; Wading River, N. Y., Long Pond, VIII; Staten Island, VI, VII. Females have been observed ovipositing in the stems of grasses growing on the edge of a small pond on Staten Island, July 15.

L. uncatus Kirby.

Newfoundland, N. J., VII, 4 (Davis); Bronxville, N. Y., VII (Woodruff). This is an addition to the New Jersey list.

L. vigilax Hagen.

Yaphank, N. Y., VII; Wading River, N. Y., VIII; Wyandanch, N. Y., VII; Lakehurst, N. J., VI, VIII, IX.

L. rectangularis Say.

Commonly distributed in the vicinity of N. Y. City from VI–IX.

L. forcipatus Rambur.

Bronxville, N. Y., VI, VII, VIII; Yaphank, IX; Wading River, N. Y., Deep Pond, VIII; Staten Island, IV–VIII.

L. disjunctus Selys.

Wading River, N. Y., Long Pond, VIII. It has also been taken at Calverton, Long Island, N. Y., in Sept. which, however, is somewhat beyond our limits.

L. inæqualis Walsh.

Morris Co., N. J. (C. W. Johnson, N. J. list); Staten Island, VI, VII.

Genus ARGIA Rambur.

A. moesta putrida Hagen.

Chatham, N. J., VIII (Dr. Calvert, N. J. list); Greenwood Lake, N. J., VI, 30 (Watson); Little Falls, N. J., VII.

A. translata Hagen.

Hank's Pond near Newfoundland, N. J., IX. Hopatcong, N. J., VII (S. N. Rhoads, N. J. list).

A. tibialis Rambur.

Singac, N. J., VI, 15. In the low meadows bordering the Passaic River.

A. apicalis Say.

Staten Island.

A. bipunctulata Hagen.

Newfoundland, N. J., VI, 4; Lakehurst, N. J., VI, VII.

A. violacea Hagen.

Bronxville, N. Y., VII (Woodruff); Newfoundland, N. J., VII; Staten Island, VII, VIII; Yaphank, N. Y., VII, IX; Smithtown, N. Y., VIII; Wyandanch, N. Y., VII, Flushing, N. Y., VIII; Lakehurst, N. J., V, 30, VII. To be found about most ponds and the commonest species of the genus.

Genus ENALLAGMA Charpentier.

E. durum Hagen.

In the New Jersey list it is reported from Toms River and other localities in the southern part of the state.

E. cyathigerum Charpentier (annexum Hagen).

West Point, N. Y., VI, 4; Ramsey, N. J., V, 20. This is an addition to the New Jersey list.

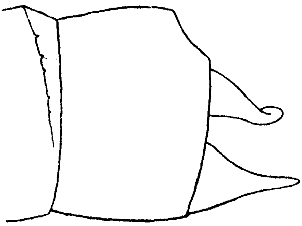
E. geminatum Kellicott.

Lake Hopatcong, N. J., IX (Dr. Calvert, N. J. list); Jamesburg, N. J., VII (P. Laurent, N. J. list); Staten Island, VIII, 8, 1909, many in Clove Valley; Yaphank, N. Y., VII, IX; Wyandanch, N. Y., VII; Flushing, N. Y., VIII.

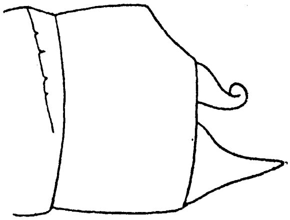
Enallagma recurvatum new species.

Male.—Head black, beneath pale, the following blue; band on front between eyes and postocular spots. Prothorax black above, pale beneath; thorax pinkish or yellowish, a middorsal, a humeral stripe and a spot on the first and second sutures just under the wing bases, black; in alcohol metallic greenish black. Abdominal segments pale beneath, blue above and black as follows: a basal spot on dorsum and a minute apical spot each side on 1, a short apical spot connected with a narrow apical ring on 2, apical third of 3, apical half of 4, apical two thirds of 5, apical three quarters of 6, all of 7 except basal ring, a narrow black linear spot each side on 8, dorsum of 10. Legs pale; femora above and tibia anteriorly, black; tarsi pale, black at sutures and tips of claws. Superior abdominal appendages black, tipped with pale, inferiors pale, tipped

with black. In shape like those of *hageni* Walsh, but with the superiors shorter and the extremities more upturned, as shown in the accompanying figures.



E. HAGENI



E. RECURVATUM

Female.—Head and prothorax colored as in the male, abdomen pale beneath with dorsum black with indications of basal rings, the black on the eighth segment becoming more or less of an apical spot. No constant differences have been discovered between the females of this species and *hageni*. Abdomen, male, 22 mm.; female, 21 mm. Hind wing, male, 15 mm.; female, 16 mm.

The type male is from Wyandanch, Long Island, N. Y., July 1, 1910, and the female from Lakehurst, N. J., June, 1898, when a pair were taken in copulation. Nine male paratypes and one female are from Wyandanch, and three males from Lakehurst collected in May and June.

The species is most nearly related to *Enallagma hageni,* being colored about as in that insect, but may be readily told from it by the shorter superior appendages of the male. Some of the male paratypes are without the linear spot on each side of segment eight. The species has been named *recurvatum* on account of the character of the male superior appendages. Mr. E. B. Williamson, Dr. Philip P. Calvert and Prof. Albert P. Morse have each examined a single male of this *Enallagma* from Wyandanch, and Prof. Raymond C. Osburn has seen the entire series. To them, and to Mr. John A. Grossbeck, who made the outline sketches of the male abdominal appendages, I am under obligations.

E. piscinarium Williamson.

Lakehurst, N. J., V, 29, 1910 (Woodruff). This is an addition to the New Jersey list.

E. divagans Selys.

Long Island (N. Banks, N. Y. list); Lakehurst, N. J., V, 30.

E. exsulans Hagen.

Pine Island, N. Y., VI; Bronxville, N. Y., VII (Woodruff); West Farms, N. Y. City (J. Angus).

E. ebrium Hagen.

Newfoundland, N. J., VII; Lake Hopatcong, N. J., VII. This is an addition to the New Jersey list.

E. carunculatum Morse.

Stony Point, N. Y., VI; Bronxville, N. Y., VI, VIII (Woodruff); Yaphank, N. Y., VII, IX; Newfoundland, N. J., VII.

E. doubledayi Selys.

Wading River, N. Y., Deep Pond, VIII.

E. civile Hagen.

A common species about ponds, etc., from June to September, and generally distributed. Some of the localities are Yaphank, Fire Island, Flushing, Bronxville and Staten Island, New York, and Newfoundland, Seabright and Lakehurst in New Jersey.

E. aspersum Hagen.

Dobb's Ferry, N. Y., VII (G. D. W. Williamson, N. Y. list); Yaphank, N. Y., VII, Staten Island, VI, VII, VIII. In the Canadian Entomologist, Vol. XXVI, p. 77, Mr. Banks records *E. triviatum* from Long Island, which he informs me by letter was a wrong identification.

E. pictum Morse.

Wyandanch, N. Y., VII; Lakehurst, N. J., IX. Found about ponds and ditches.

E. signatum Hagen.

Yaphank, N. Y., IX; Flushing, N. Y., VIII; Cold Spring Harbor, N. Y., VII (H. G. Barber); Staten Island, VI, VIII.

E. pollutum Hagen.

Yaphank, N. Y., IX; Lake Hopatcong, N. J., IX (Dr. Calvert, N. J. list).

Genus NEHALENNIA Selys.

N. irene Hagen.

Nyack, N. Y., VI, Bronxville, N. Y., VII (Woodruff); Wyandanch, N. Y., VII; Yaphank, N. Y., VII; Forest Park, Brooklyn, N. Y., VI; Staten Island, VI; Ft. Lee, N. J., VI (Daecke, N. J. list): Lakewood, N. J., VI.

N. gracilis Morse.

Yaphank, N. Y., VII; Lakehurst, N. J., VI.

Genus AMPHIAGRION Selys.

A. saucium Burmeister.

Yaphank, N. Y., VI; Half Way Hollow Hills, Long Island, N. Y., VII; Staten Island, V, VI, VIII; Hewitt, N. J., VI; Newfoundland, N. J., VII. Often found in moist meadows.

Genus CHROMAGRION Needham.

C. conditum Hagen.

Hewitt, N. J., VI; Lakehurst, N. J., V.

Genus ISCHNURA Charpentier.

I. verticalis Say.

From May to September and generally distributed, being found even in the city parks.

I. ramburii Selys.

Fire Island, N. Y., IX; Staten Island, IX, X.

I. posita Hagen.

From May to September and generally distributed.

Genus ANOMALAGRION Selys.

A. hastatum Say.

Bronxville, N. Y., VII (Woodruff); Staten Island, VII, VIII, IX, X, and XI, 2, 1902. Sandy Hook, N. J., VIII. Found on salt meadows as well as about freshwater ponds, etc.

Family ÆSCHNIDÆ.

Genus TACHOPTERYX Selys.

T. thoreyi Hagen.

West Point, N. Y., VI, 18; Ramapo, N. Y., VI, 7 (Watson). This dragonfly is often found resting on the trunks of trees where, owing to its gray color, it can hardly be detected.

Genus CORDULEGASTER Leach.

C. diastatops Selys.

Hewitt, N. J., V, VI; Lake Hopatcong, N. J., VI; Lakehurst, N. J., V. Sometimes not uncommon in low-lying moist meadows.

C. maculatus Selys.

Yaphank, N. Y., V (Engelhardt); Nyack, N. Y., VI; Ramapo, N. Y., V, 31; Bronxville, N. Y., VI (Woodruff); Staten Island, V, VI; Greenwood Lake, N. J., VII; Newfoundland, N. J., VII; Lakehurst, N. J., V, 22 (Engelhardt). Often found flying up and down brooks.

C. erroneus Hagen.

Bear Swamp, Ramapo Mountains, N. J., VII, 18, 1910, ♂ (Chas. E. Sleight). This is an addition to the New Jersey list.

C. obliquus Say.

Pine Island, N. Y., VI; Palisades, N. J., VI (Engelhardt); Van Cortlandt Park, N. Y. City, VI (Watson); Lake Hopatcong, N. J., VI (Watson). On June 19, 1898, two were captured in Bronx Park, N. Y. City, near to where the bear dens have since been located.

Genus GOMPHOIDES Selys.

G. obscura Rambur.

Found on several occasions in May and June flying up and down a shaded ditch by the side of the railroad track at Lakehurst, N. J. Wading River, N. Y., Deep Pond, Aug. 7, 1912.

Genus HAGENIUS Selys.

H. brevistylus Selys.

Long Island (Engelhardt); Newfoundland, N. J., V, VII. On the 4th of July, 1897, two of these dragonflies were observed on Jefferson Mt., near Newfoundland, N. J., engaged in chasing butterflies. One of them was particularly active, and every *Papilio* or *Limenitis* that came near was pursued, but it was not successful in catching any of them.

Genus OPHIOGOMPHUS Selys.

O. johannus Needham.

Hewitt, N. J., VI, 19, 1904.

O. rupinsulensis Walsh.

Dover, N. J., (C. W. Johnson, N. J. list). Ramapo Mts., near Halifax, N. J., several found near a stream.

Genus LANTHUS Needham.

L. albistylus Hagen.

Bear Swamp, Ramapo Mountains, N. J., VI, VII (Chas. E. Sleight). This is an addition to the New Jersey list.

L. parvulus Selys.

Ramapo, N. Y., V; Hewitt, N. J., V (Watson); Schooley's Mt., N. J., V; along South Branch of Raritan River, N. J., V.

Genus GOMPHUS Leach.

G. lividus Selys (sordidus Hagen).

Pine Island, N. Y., VI; Bronxville, N. Y., VI (Woodruff); Newfoundland, N. J., VII; South Branch of Raritan River, N. J., VI.

G. exilis Selys.

Generally distributed about New York City and found in May and June.

G. ventricosus Walsh.

Pine Island, N. Y., VI, 19, 1912. This appears to be an addition to the list of New York State dragonflies.

G. plagiatus Selys.

Long Island (C. Olsen); Runyon, N. J., IX, 4 (Watson).

G. spicatus Hagen.

Newfoundland, N. J., V, VI.

G. villosipes Selys.

Ramsey, N. J., VI; Staten Island, VI.

G. fucifer Hagen.

Hewitt, N. J., VI, 19.

Genus DROMOGOMPHUS Selys.

D. spinosus Selys.

Pine Island, N. Y., VI; Van Cortlandt Park, N. Y. City, VII (Watson); Sparta, N. J., VII; Newfoundland, N. J., VII; Lake Hopatcong, N. J., VII.

Genus BOYERIA MacLachlan.

B. vinosa Say.

Yaphank, N. Y., VII, IX; Smithtown, N. Y., VIII; Staten Island, VII, VIII; Sparta, N. J., VII; Newfoundland, N. J., VII, IX; Lake-

hurst, N. J., VII. This insect is quite crepuscular in habit, and sometimes flies when it is so dark that it can be distinguished with difficulty. Sometimes each *vinosa* appears to have a certain "beat" on the ditch or brook up and down which it flies, while a little further on will be another *vinosa*, also confined to a limited range.

Genus BASIÆSCHNA Selys.

B. janata Say.

Pine Island, N. Y., VI; Bronxville, N. Y., VI (Woodruff); Yaphank, N. Y., V, VI; Staten Island, V; Newfoundland, N. J., V; Paterson, N. J., V; Ramsey, N. J., V; Lakehurst, N. J., V.

Genus GOMPHÆSCHNA Selys.

G. furcillata Say.

Yaphank, N. Y., V, VI; Ramapo, N. Y., VI; Hewitt, N. J., VI; Newfoundland, N. J., V, VI; Beaver Lake, N. J., VI; Lakehurst, N. J., V, VI.

G. furcillata antilope Hagen.

Newfoundland, N. J., VI.

Genus ANAX Leach.

A. junius Drury.

Generally distributed and common. Flies from March to October. On one occasion eight of these insects were observed flying about on the lea side of a barn looking for the flies that had taken refuge there from the strong wind that was then blowing.

A. longipes Hagen.

Yaphank, N. Y., VII; Staten Island, VI, VIII; Orange, N. J.; Lakehurst, N. J., VII.

Genus ÆSHNA Fabricius.

A. clepsydra Say.

Wading River (Deep Pond), N. Y., VIII; Greenwood Lake, VII; Terrace Pond, Passaic Co., N. J., VIII; Newfoundland, N. J., IX; Lakehurst, N. J., IX.

A. canadensis Walker.

Newfoundland, N. J., VII; Staten Island, VI.

A. verticalis Hagen.

Normanock, N. J., VII; Point Pleasant, N. J., IX; Lakehurst, N. J., IX; Brooklyn, N. Y., VII, IX (Engelhardt); Cold Spring Harbor, N. Y., VIII (H. G. Barber); Staten Island, VI, IX. On October 21, about 4 o'clock in the afternoon, a female was seen to crawl down a stick, lying in a slow flowing spring, until it was entirely beneath the surface of the water.

A. umbrosa Walker.

Bronxville, N. Y., IX, X (Woodruff); Yaphank, N. Y., X; Pinelawn, N. Y., IX; Staten Island, VIII, IX, X; Newfoundland, N. J., IX; Bear Swamp, Ramapo Mts., N. J., IX; Ft. Lee, N. J., VIII; Cranford, N. J., VIII; Morgan, N. J., X; Mattawan, N. J., IX. Found flying up and down brooks.

A. constricta Say.

Bronxville, N. Y., VII (Woodruff); Flatbush, N. Y., IX. While the species of *Æshna* are most often found about their breeding places they are great flyers, and may be seen most anywhere in the vicinity of New York City as well as in the city itself.

Genus EPIÆSCHNA Hagen.

E. heros Fabricius.

Generally distributed and found from May to September. It often enters buildings and may be seen flying up and down the streets in the heart of the city. A female was observed on Staten Island, on the 28th of July, laying eggs in dead, water-soaked branches lying in swampy pools in the woods.

Family LIBELLULIDÆ.

Genus DIDYMOPS Rambur.

D. transversa Say.

Ramapo, N. Y., VI; Hewitt, N. J., VI; Bear Lake, N. J., VI (Engelhardt); Newfoundland, N. J., V, VI, VII; Mt. Arlington, N. J., VII (Watson); Great Notch, N. J., V.

Genus MACROMIA Rambur.

M. illinoiensis Walsh.

Ft. Montgomery, N. Y., V; Ramapo, N. Y., VI; Newfoundland, N. J., VII; Lakewood, N. J., VII.

Genus EPICORDULIA Selys.

E. princeps Hagen.

Greenwood Lake, VI, VII (Watson); Newfoundland, N. J., VI, VII; Hopatcong, N. J., IX, 14 (Dr. Calvert, N. J. list); Singac, N. J., VI; New Brunswick, N. J., VII (Coll. N. J. Agri. Exp. Sta.); N. Y. City, VI (Woodruff).

Genus NEUROCORDULIA Selys.

N. obsoleta Say.

Lake Hopatcong, N. J., VI, VII, IX (N. J. list).

Genus HELOCORDULIA Needham.

H. uhleri Selys.

Newfoundland, N. J., V, 28; Lakehurst, N. J., V, 24.

Genus TETRAGONEURIA Hagen.

T. spinosa Hagen.

Great Notch, N. J., V, 5 (Dr. Love, N. J. list); Old Bridge, N. J., IV, 23.

T. spinigera Selys.

Greenwood Lake, N. J., VI, 30 (Watson); Newfoundland, N. J., V, 28 (Davis). This is an addition to the New Jersey list.

T. semiaquea Burmeister.

Yaphank, N. Y., V, 29; Ramapo, N. Y., V, VI; Ramsey, N. J., VI; Newfoundland, N. J., V; Lakehurst, N. J., V, VI.

T. cynosura Say.

Pocantico Hills, N. Y., VI (Woodruff); West Point, N. Y., VI; Ramapo, N. Y., V; N. Y. City, Wall St., VI (Woodruff); Staten Island, V, VI, VII; Hewitt, N. J., VI. On May 28, 1910, there was a remarkable gathering of this species, together with an occasional *spinigera* and *semiaquea,* along the road leading from Newfoundland, N. J., to Cedar Pond. The air was full of these dragonflies, and on one small dead bush we counted twenty-two individuals, and there were other bushes and stems of plants that also had a great many resting upon them.

Genus DOROCORDULIA Needham.

D. lepida Hagen.

Jamesburg, N. J., VII (Daecke, N. J. list); Lakehurst, N. J., V, VI.

D. libera Selys.

Bronxville, N. Y., V; N. Y. City, V (Woodruff); Normanock, N. J., VII; Beaver Lake, N. J., VI (Engelhardt); Newfoundland, N. J., V, 28 (C. Schaeffer); Paterson, N. J., V, 24 (Coll. N. J. Agri. Exp. Sta.).

Genus SOMATOCHLORA Selys.

S. filosa Hagen.

Lakehurst, N. J., VII.

S. tenebrosa Say.

Ramapo Mts., N. J., VIII (Watson); Jamesburg, N. J., VII; Lakehurst, N. J., IX; Hauppaug, N. Y., VIII.

Genus LADONA Needham.

L. exusta Say.

Croton, N. Y., VII; Ramapo, N. Y., VI; Ramsey, N. J., V; Newfoundland, N. J., V, VI, VII; Lake Hopatcong, N. J., VII.

L. exusta deplanata Rambur.

Amityville, N. Y., VI (W. T. Bather); Wyandanch, N. Y., IV; Newfoundland, N. J., V; Lakewood, N. J., VI; Lakehurst, IV, V, VI.

Genus LIBELLULA Linné.

L. luctuosa Burmeister (basalis Say).

Bronxville, N. Y., VII (Woodruff); Van Cortlandt Park, N. Y. City, VII; Flushing, N. Y., VIII; Staten Island, VI, VII, VIII; Sparta, N. J., VII; New Brunswick, N. J., VI (Coll. N. J. Agri. Exp. Sta.).

L. auripennis Burmeister.

Wading River, N. Y., Long Pond, VIII; Coney Island, N. Y.; Staten Island, V, VI, VII. We have captured a male of this species on Staten Island, July 4, 1900, flying over a small pond grasping a female *L. semifasciata*.

L. flavida Rambur.

Westchester Co., N. Y. (W. Beutenmuller, N. Y. list); Ramsey, N. J., VII; Lakehurst, N. J., VI, VII, VIII. It is quite common at the last mentioned locality.

L. cyanea Fabricius.

Bronxville, N. Y., VI, VII; Riverdale, N. Y., VII (Woodruff); Yaphank, N. Y., VII; Half Way Hollow Hills, N. Y., VII; Flushing, N. Y., VIII; Staten Island, VI–VIII; Newfoundland, N. J., VII; Fort Lee, N. J., V, VI (Woodruff); Jamesburg, N. J., VI, VII.

L. vibrans Fabricius.

Staten Island, VI, VII, VIII; Lakehurst, N. J., VI (Woodruff). This species was common on Staten Island in the summers of 1894, 1899 and 1908. It was also collected in 1895 and 1912.

L. axillena Westwood.

Staten Island, Buck's Hollow, V, 31, 1908, two males.

L. incesta Hagen.

Croton, N. Y., VI; Yaphank, N. Y., VII; Wading River, N. Y., Long Pond, VIII; Ramapo, N. Y., VI; Normanock, N. J., VII; Lake Hopatcong, N. J., VII; Staten Island, VII, VIII.

L. quadrimaculata Linne.

Bronxville, N. Y., VI, VII (Woodruff); Staten Island, V, 11, 1889, and VI, 19, 1893; Lake Hopatcong, N. J. (S. N. Rhoads, N. J. list).

L. semifasciata Burmeister.

Bronxville, N. Y., V, VI, VII (Woodruff); Yaphank, N. Y., VII; Aqueduct, Long Island, N. Y., VII; Staten Island, IV, V, VI, VII, VIII, IX; Fort Lee, N. J., V, VI (Woodruff); Lakehurst, N. J., VII.

L. pulchella Drury.

A generally distributed species and found principally about ponds from May to September.

Genus PLATHEMIS Hagen.

P. lydia Drury (trimaculata DeGeer).

Bronxville, N. Y., VI; Van Cortlandt, N. Y., VI (Woodruff); Yaphank, N. Y., VII; Flushing, N. Y., VIII; Staten Island, V, VI, VII, VIII, IX; Ft. Lee, N. J., V, VI; Lakehurst, N. J., VI (Woodruff).

Genus PERITHEMIS Hagen.

P. domitia tenera Say.

Tarrytown, N. Y., VII; Van Cortlandt, N. Y., VII; Bronxville, N. Y., VII, VIII (Woodruff); Wading River, N. Y., Long Pond, VIII; Flushing, N. Y., VIII; Prospect Park Lake, Brooklyn, N. Y., VIII; Staten Island, VI, VII; Westfield, N. J., VII.

Genus NANNOTHEMIS Brauer.

N. bella Uhler.

Westchester Co., N. Y. (W. Beutenmuller, N. Y. list); Yaphank, N. Y., VII; Wyandanch, N. Y., VII; Staten Island, VI, VII; Beaver Lake, N. J., VI (Engelhardt); Lakehurst, N. J., V, VI, VII.

Genus ERYTHRODIPLAX Brauer.

E. berenice Drury.

Riverdale, N. Y., VII (Woodruff); Rockaway Beach, N. Y., VII, VIII; Flushing, N. Y., VIII; Cold Spring Harbor, N. Y., VII (H. G. Barber); Staten Island, V, VI, VII, VIII; S. Amboy, N. J., VII; Seabright, N. J., VII (Woodruff). One was taken at Lakehurst, N. J., July 28, 1907, but this dragonfly is usually not found so far inland, and is often quite common on the salt meadows, where of a quiet evening they may be seen settled on the grass stems, in which position they spend the night. In many places where the meadows have been ditched to prevent the mosquitoes from developing, this dragonfly, which devours mosquitoes, has also become far less numerous.

Genus ERYTHEMIS Hagen.

E. simplicicollis Say.

Wading River, N. Y., VIII; Yaphank, N. Y., VII; Flushing, N. Y., VIII; Staten Island, V, VII, VIII; Fort Lee, N. J., V (Woodruff); Westfield, N. J., VII; Lakehurst, N. J., VI, VII.

Genus SYMPETRUM Newman.

S. rubicundulum Say.

Generally distributed and found from June until September.

S. obtrusum Hagen.

Staten Island, VI, VII; Sandy Hook, N. J., VIII.

S. semicinctum Say.

Croton, N. Y., VII; Riverdale, N. Y., VII; Bronxville, N. Y., VIII (Woodruff); Van Cortlandt Park, N. Y. City, VIII; Staten Island, VII, VIII, IX, 15; Sparta, N. J., VII.

S. vicinum Hagen.

West Point, N. Y., X; Yaphank, N. Y., X; Bowling Green, N. Y. City, X; Staten Island, IX, X, XI; Lake Hopatcong, N. J., VII (S. N. Rhoads, N. J. list); Jamesburg, N. J., IX; Lakehurst, N. J., VIII, X. This is one of the latest of our dragonflies and is to be found far into the fall. We have seen them in copulation on Staten Island on November 8. They are much attracted to anything light colored, like a newspaper lying on the ground, and several may often be seen sunning themselves in such a situation. They will light on your hat, if you keep quiet, and will show no inclination to fly away provided you walk about quietly.

S. corruptum Hagen.

Staten Island, shore at Eltingville, VI, 27, 1896, and New Dorp, VIII, 8, 1903; Barnegat, N. J., VIII, 25, 1900. This species is much more common in the west and only occasionally found within our limits.

Genus PACHYDIPLAX Brauer.

P. longipennis Burmeister.

Riverdale, N. Y., VII (Woodruff); Flushing, N. Y., VIII; Brooklyn, N. Y., Forest Park, VI; Staten Island, VI, VII, VIII, IX; Lakehurst, N. J., VI.

Genus LEUCORRHINIA Brittinger.

L. intacta Hagen.

Croton, N. Y., V; Bronxville, N. Y., VI (Woodruff); Manhattan Island, N. Y. City, VI; Staten Island, V, VI; Normanock, N. J., VII; Newfoundland, N. J., VII; Ramsey, N. J., VI; South Orange, N. J., IV, 18 (Collection N. J. Agri. Exp. Sta.).

Genus CELITHEMIS Hagen.

C. ornata Rambur.

Yaphank, N. Y., VII, VIII; Wading River, N. Y., Long Pond, VIII; Jamesburg, N. J., VII, VIII; Lakehurst, N. J., VII, VIII, IX.

This species occurs along the coast from Maine to Florida, but does not appear to have been previously reported from New York State.

C. elisa Hagen.

West Point, N. Y., VI; Tarrytown, N. Y., VII; Pocantico Hills, N. Y., VI; Bronxville, N. Y., VI (Woodruff); Yaphank, N. Y., VII; Wading River, N Y., VIII; Flushing, N. Y., VIII; Staten Island, VI, VII, VIII; Hewitt, N. J., VII; Newfoundland, N. J., VII; Newark, N. J., VII; Lakehurst, N. J., VI, VII.

C. monomelæna Williamson.

Wading River, N. Y., VIII, 8, 1912. Two males flying over the white sand at the southerly end of Long Pond. This species has been recorded from southern New Jersey, but appears not to have been listed from New York state.

The specific name *monomelæna* Williamson has been used, and based on maculation this is correct. In the four specimens in the author's collection, however, from Long Island, N. Y., New Jersey and Virginia, five fore wings have two cross veins in each triangle and three fore wings have but one cross vein in each triangle. See Ohio Naturalist, Vol. X, p. 153, 1910.

C. eponina Drury.

Tarrytown, N. Y. (Woodruff); Flushing, N. Y., VIII; Cold Spring Harbor, N. Y., VIII (H. G. Barber); Staten Island, V, VII, VIII; Lake Hopatcong, N. J., VII; Lakehurst, N. J., VII.

Genus PANTALA Hagen.

P. flavescens Fabricius.

Staten Island, VII, VIII, IX. We have seen great numbers flying over a field of oats on Staten Island; also a female laying eggs on August 14, in a ditch of brackish water by the side of the road at Watchogue, Staten Island. This is a widely distributed species.

Genus TRAMEA Hagen.

T. lacerata Hagen.

West Point, N. Y., VI, 17; Staten Island, V, VI, VIII, IX. Sometimes not uncommon over fields and the salt meadows on Staten Island.

T. carolina Linne.

Bronxville, N. Y., V (Woodruff); Yaphank, N. Y., VII; Wading River, N. Y., VIII; Staten Island, IV, V, VI, VII, IX, X; Newfoundland, N. J., IX; Great Notch, N. J., V; Jamesburg, N. J., IX; Lakehurst, N. J., IV, 25, 1908, many individuals and a pair in copulation; VI, VIII. Only two or three of our dragonflies have as long a season as this, namely from April to October. We quote the following from the "Preliminary List of the Dragonflies of Staten Island with notes and Dates of Capture" (this JOURNAL, Sept., 1898): "On July 15, 1894, a male *Tramea carolina* was flying over one of the Four Corners iron mine ponds. Soon a female came and commenced dipping her abdomen into the water. In a moment she was seized by the male and they flew away. In a half hour they were back and went flying about together, the male now and then suddenly letting go his hold and with equal rapidity catching the female again by the neck. Other male dragonflies flew after them and when the female stopped to lay eggs, they annoyed her considerably. The chief among the disturbers was a *Libellula basalis.* After a time the male *Tramea* left his mate and she was quickly seized by the aforesaid *Libellula basalis,* after which they flew about together for a considerable time. After letting go his hold once and flying down the pond, the *L. basalis* returned and seized the *Tramea* a second time."

AQUATIC HEMIPTERA.

BY H. G. BARBER,

ROSELLE PARK, N. J.

The aquatic Hemiptera have excellent and frequently wonderful adaptations to their environment, exhibiting among them most marvelous variability of construction for their life in or on the water. The local, strictly aquatic species, belong to ten families of the heteropterous Hemiptera. These for convenience of treatment of relation of adaptations to habit may be grouped into (1) those which spend their active existence on the surface of the water, (2) those which habitually walk about upon some substratum beneath the water and (3) those which are, for the most part, free swimmers.

In all of these the most striking adaptations of structure are connected with habits of locomotion, breathing and feeding, which are variously modified to suit the particular environment referred to above. With few exceptions these are all carnivorous and are equipped with the short stout beaks necessary for piercing the tissues and sucking the juices of animals. Correlated with this, the great majority have the fore legs modified for seizing and holding the prey.

Although a few forms in the west have been recorded as occurring in water strongly impregnated with various mineral salts, and a few of our local forms in brackish water, they are for the most part strictly fresh water forms. The species likely to occur in any body of water is determined somewhat by the character of the water, the nature of the current and the presence or absence of accumulated plant life. Some species preferring the swift moving stream in which they seem to love to sport against the force of the current; others, and perhaps the greatest number, are found only in still waters of ponds or the quiet waters of bayed out parts of streams where they sometimes congregate in immense numbers.

Quite a number of these aquatic hemiptera, notably members of the families Belostomatidæ, Corixidæ and Notonectidæ, have well-developed wings and readily migrate from one body of water to another and at such times, as has been frequently observed, are attracted to bright lights. The great majority of species, however, are fixed in their environment and though provided with wings are frequently incapable of flight. Others are dimorphic as to wings. In the Gerridæ and allied families there occur a number of species in both the winged and unwinged state.

The species which live actively upon the surface of the water belong to the following families, Gerridæ, Veliadæ, Hydrometridæ, Neogeidæ and Mesoveliadæ. They have more or less elongated bodies and slender legs. The beautiful ease with which they glide and skip about over the surface of the water is due to the fine plush-like coating of hairs on the feet and ventral parts of the body by means of which they are enabled to enmesh a thin film of air which sustains their weight on the surface film and keeps the body dry. Unlike the members of the second and third groups the antennæ are well developed and exposed. As they breathe surface air they have no peculiar method of respiration differing from terrestrial forms. Some of these

forms prefer the current of swiftly moving streams, but the majority find more congenial surroundings on the surface of quieter waters and a few may even make excursions upon land, where they may be found in damp situations. They are all carnivorous, using the fore legs for holding their prey, which usually consists of dead or living insects. They all hibernate, concealing themselves at the bottom of their retreat to reappear again on the surface early in the spring.

The forms which walk about on submerged sticks or stem of plants beneath the water belong to the family Nepidæ. The most striking modification they present is a long respiratory tube through which they may breathe surface air while the body is concealed beneath the water. Their legs are long and slender and the fore legs are strong and raptatorial for holding the prey. They more frequently occur in shallow, sluggish streams or ponds well supplied with plant life. Only three species are likely to occur in this vicinity belonging to the genus *Nepa* and *Ranatra*.

The free swimming forms are more abundant, locally, than in the two preceding groups. They usually have the hind pair of legs either broadened or fringed with long hairs to resist the water and serve as a swimming organ. Here are included the families Corixidæ, Belostomatidæ, Naucoridæ and Notonectidæ—a group of carnivorous forms, with the possible exception of *Plea striola*, having the customary short, stout beak. Some of these species are of economic importance as they frequently attack young fish or destroy their eggs.

The Corixidæ, or water boatmen, are the most numerous in species The hind legs are fringed with long hairs and their fore legs are peculiarly modified, bearing characters which are largely used in their specific differentiation. Carrying a supply of air beneath the elytra, they may remain submerged for an indefinite period.

The Belostomatidæ include some of the largest hemiptera known. The second and third pairs of legs are broad and paddle like and fringed with long hairs. The fore legs are developed into strong clasping organs. They are good swimmers and strong fliers, frequently attracted to light several miles from their breeding places.

The Notonectidæ, or back swimmers, have the not much broadened swimming hind tibiæ fringed with hair and the modified clasping fore-legs. The ventral surface is provided with a mass of long hairs which enmeshes a supply of air for use beneath the surface. The species

differ considerably among themselves as to the quality of water they may select for their abode; *Notonecta undulata*, for instance, may occur in the foulest kind of pools, while others must have comparatively clean water.

The family Naucoridæ includes some broad, ovate forms which seem to prefer waters well stocked with vegetable matter. They have the usual talon-like fore legs, but as their hind legs are neither broadened nor fringed with hair, they are poor swimmers, depending more upon walking about upon the submerged plants.

Of all of the Heteroptera perhaps the aquatic species have been less well and accurately known to American entomologists than any other group. This has been due to the fact that because of their wide distribution, ease of collecting, and generally larger size they received the attention of earlier systematists, who were satisfied to give them but a brief and not distinctive characterization to make them recognizable without an examination of the types. These types, for the most part, having either been destroyed or deposited in museums abroad systematists have depended upon the meager descriptions at hand, with the result that there has arisen considerable confusion and uncertainty in fixing certain species. Especially is this so in the family Corixidæ.

AQUATIC COLEOPTERA.

BY CHAS. W. LENG,

WEST NEW BRIGHTON, N. Y.

Few, if any, beetles are aquatic throughout all the stages of their existence; even those commonly called water beetles pupate on land and sometimes at least lay their eggs on leaves out of the water. The beetles which are more or less aquatic in habit include the several families of water beetles, the Parnidæ and Elmidæ, the tribe Donaciini in Chrysomelidæ, some tribes of snout beetles and a few other smaller families. All of these exhibit some modifications of structure and vestiture in harmony with their aquatic life, modifications that are on the whole more marked in the adults than in the larvæ, especially in the case of the plant-infesting species; all exhibit a more

or less definite preference for certain environments by which their distribution is governed, while at the same time this distribution is also more or less controlled by such factors as temperature and accident.

The modifications involve the parts used in locomotion and for attachment to stationary objects, in copulation, in flotation and particularly in respiration. The modifications of the legs of the Dytiscidæ to fit them for swimming and of the male front tarsi to assist in holding the female are too well known to need extended mention. The great development of the claws in Parnidæ and Elmidæ, which, living often in rapid streams, require these elongated and recurved appendages to maintain their position, is probably also sufficiently well known. The modification of the claws of Haliplidæ larvæ to enable them to maintain their position on filamentous algæ is not so well known. It is well described by Matheson in the September number of our JOURNAL. In the study of the modifications of vestiture of aquatic insects and their relation to flotation and respiration, such progress has been made by Frank Brocher during the last three years, that a more detailed mention is necessary, particularly as, according to his conclusions, much of the information contained in our books is erroneous.

The surface of the body of aquatic insects is often observed to be covered at least in part with hair, or in some snout beetles by closely imbricated scales instead, both evidently designed to keep the body dry so that the hairs have received the name of hydrofuge pubescence. Such insects in the water are often observed with a silvery globule of air entangled in the pubescence. Moreover, special appliances for retaining air are found, as in the enlarged coxal plates of the Haliplidæ, and in the arched elytra of the Hydrophilidæ, leaving a relatively great space between them and the dorsal aspect of the abdomen, in which the stigmata are situated. The Dytiscidæ may be seen coming to the surface and hurriedly descending with a globule of air attached to the anal extremity. All these facts seem to point to the conclusion that such insects are thus provided with hairs, etc., to enable them to carry air with them below the surface of the water for breathing purposes. But quite erroneously, if as Brocher has sought to demonstrate such supplies of air are more nearly analogous to that contained in the sound of a fish, and serve the purpose of lessening

the specific gravity of the creature, and thus assisting it in floating. The body of a whirligig is hairy beneath; the air entangled in the hairs in part supports the beetle on the surface, and permits of its evolutions. A muscular effort is necessary to send many water beetles below the surface, and their claws are required to keep them below, grasping some water plant. This is illustrated in the floating to the surface of *Hydrochus* and *Helophorus*, when the water net disturbs their grip on aquatic plants. With others, as the Dytiscidæ, the escape of the air from beneath the elytra increases their specific gravity and their descent is thereby facilitated. The bubble of air seen at the anal extremity as a Dytiscid disappears beneath the water is an expelled bubble, not one that is to be inhaled. In short, the phenomena and structural modifications heretofore assumed to be connected with respiration are, at least in great part, connected with flotation or maintenance of equilibrium.

Respiration is according to Brocher effected in Haliplidæ and Dytiscidæ by drawing in air through the last two abdominal stigmata, and expelling it through the other stigmata, particularly the anterior pair. He has detected in *Cybister* and less distinctly in other genera air pockets in the midst of the muscular masses of the meso-thorax and meta-thorax, which are connected directly with these anterior stigmata, and explain their larger size, but he expresses an opinion that no large quantity of air is habitually stored therein, the action of respiration being in these beetles rather a thorough ventilation of the whole tracheal system. The arrangement of the stigmata and their relation to the extraordinarily enlarged coxal plates is illustrated in the September number of our JOURNAL. In other aquatic insects, and especially those which do not come to the surface frequently to breathe, but remain below the surface for long periods, even for weeks at a time in some cases, a complicated system of pubescence serves to supply the small quantity of air required by comparatively inactive creatures, and to permit of this supply being obtained from aquatic plants or from the aerated waters of rapid streams. The simple hydrofuge pubescence, consisting of hairs set nearly perpendicular to the body and designed simply to retain a body of air, is replaced by a double arrangement of hairs; one series is curved so as to become parallel to the body and applied one above the other, like shingles, whereby a sheath-like enclosure of the body is effected, and a second

series external to the first and capable of absorbing and holding the aerated water from which an attenuated layer of air is supplied to the space enclosed by the first series of curved hairs. Such hairs are found in Elmidæ, in *Hæmonia*, and in all the snout beetles like *Tanysphyrus* that live on aquatic plants and live habitually beneath the surface of the water. Experimentally Brocher found Elmidæ capable of maintaining life for at least eight weeks in aerated water, but dying soon in water deprived of air. *Hæmonia* was found to live about three weeks deprived of air and indefinitely when kept submerged but in communication with aquatic plants. Such beetles must therefore be regarded as even more completely aquatic than those commonly called water beetles.

The interesting observations of Brocher are barely sketched in these remarks, details of the respiration of many different aquatic insects may be found in his papers published in the Annales de Biologie Lacustre, Vols. 4 and 5, 1909 to 1911, with copious illustration and with the strongest internal evidence of conscientious work.

EARLY STAGES.

Special emphasis has so far been laid upon the imago stage. The importance of the larval stage in which presumably the creatures pass the greater part of their lives, feeding, growing and actively performing all their functions except reproduction, must be admitted; but unfortunately little beyond the most general information is available, for since the days of Schaupp few hereabouts except Joutel have taken any interest in rearing Coleoptera. The work thus far done on American species has been indexed by Beutenmuller, but the work of European authors is our main reliance and from it in part the following remarks have been compiled:

The larvæ of Haliplidæ, Dytiscidæ, Hydrophilidæ, Gyrinidæ and Parnidæ are purely aquatic, living wholly in the water, but not swimming. The eggs are frequently laid upon plants out of the water, sometimes within a silken enclosure, that of the Hydrophilidæ being provided with a curious prolongation as if the quantity of silk had been excessive and twisted into a pointed appendage. The larvæ of Parnidæ and Elmidæ are attached to stones, etc., by lateral expansions of the segments, and in the case of *Dryops* and *Psephenus* become almost circular in outline, and so nearly resemble Crustacea that

Psephenus larva was in fact described by DeKay as a Crustacean. The larvæ of the other families crawl along the bottom or on stems of aquatic plants, feeding on animal food in the Dytiscidæ, vegetable or mixed food in the other families, filamentous algæ in the Haliplidæ according to Matheson. The breathing apparatus is modified in these larvæ, usually tracheal extensions from the apex of the body, permitting of the creature's drawing a supply of atmospheric air by resting head down at the surface with these appendages protruding above the surface. In the larvæ of Gyrinidæ such appendages proceed from all the segments except those bearing legs, so that the larva has somewhat the appearance of a centipede. In the larvæ of some Haliplidæ, the air supply, according to Matheson, is obtained by means of numerous long-jointed tracheated spines. The larvæ of *Cnemidotus* are illustrated by Schiodte with two long slender lateral filaments proceeding from each segment, and with four recurved hooks on the anal segment, which would assist the larvæ in maintaining its hold on plants. The larvæ of *Psephenus* have been described in detail by Kellicott, in the Canadian Entomologist. They are almost circular and have waving extensions from the different segments. Among the Elmidæ, the larvæ of some species live in the exceedingly soft mud of the banks of streams and have been studied by Dufour and other foreign authors. In the larvæ of *Donacia* the eighth segment is provided with two spines apparently used for piercing the air cells of aquatic plants.

In general the larvæ of aquatic beetles may be said to be modified in respect of respiratory apparatus but otherwise they greatly resemble terrestrial larvæ.

ENVIRONMENT.

The interesting fact in connection with such aquatic Coleoptera is that each requires more or less absolutely a special environment for its development. In the cases in which it is insistent upon a particular environment, it becomes rather rare from the scarcity of the conditions it craves. Among the Dytiscidæ, for example, we find *Agabetes acuductus* only in small woodland pools, with many fallen decaying leaves. In the water itself of such pools this species is likely to be missing, but crawling among the submerged rotting leaves near the edge of the pond they may be found, probably hunting some

little animals that feed upon leaves; so also with *Copelatus glyphicus* which I have found only in submerged rotting cattails, between the layers of which their greatly flattened bodies permit them to crawl. Such species might be called rare, it is really only necessary to find their environment to find them in sufficient numbers. On the other hand, a genus like *Ilybius* seems to turn up in a variety of situations. As one recalls the days spent with the water net, how it comes to mind that Linell told us the larger species preferred the deeper waters, and must be hunted by wading bare-legged into the pond, a method that Mr. Roberts' hip boots, carried in a neat suitcase, seemed to indorse but improve. How one thinks longingly of the day *Canthydrus puncticollis* was fished out of a tiny spring hole on Staten Island, but only one specimen not since repeated; and of another day when dragging the net along the grassy edge of a little brook, produced a few *Deronectes depressus.* Along the edge of the Staten Island salt meadow, I have found *Cœlambus impressopunctatus* with scarcely enough water to keep them as wet as were my feet. It may be that some of the associations of environment and species are deceiving on account of the facility with which at least some species fly by night, especially during their mating season, and of the lack of discrimination they display in alighting. I have heard of their mistaking greenhouse glass for water, and if capable of so serious an error, they might easily get mixed as to their appropriate environments, therefore too much importance must not be attached to records of the finding of a few imagos. Nevertheless it is evident that for most species of water beetles a particular environment is an absolutely essential requisite for successful search.

The Hydrophilidæ are generally regarded as vegetable feeders, though Folsom says the larvæ are at time carnivorous, and Miss Bamford found them in captivity practically omnivorous. As now classified in our books we have three sub-families of vastly different habits combined under the name, namely: *Cercyon* and its allies, found in manure and in no sense aquatic, the Helophorini found on plants beneath the surface, crawling on them and incapable of swimming, resembling rather the Elmidæ in their habits, and the true *Hydrophilus* and its allies, all more or less free swimming creatures though none of them can equal the Dytiscidæ in this respect. As would naturally follow from their habits, these feeders upon vegetable

matter are seldom found in clear water or that containing only sphagnum moss. They must be sought in ponds rich in decaying vegetable matter, and nothing was more marked in Labrador where such ponds are non-existent than the scarcity of Hydrophilidæ. Since they too fly freely, for example the great *Hydrous triangularis* is often found beneath electric lights, data drawn from occasional occurrence of imagos must be used with caution. Notwithstanding this power of flight and the consequent wide distribution of the species, the study we made last winter of the local collection resulted in Mr. Wintersteiner's discovery that the supposed *Philhydrus cinctus* of the sandy regions of New Jersey was the more southern *P. consors*, affording an instance of the restriction of a distribution of a species by climatic conditions. As Mr. Sherman is to speak of the Dytiscidæ and Mr. Wintersteiner of the Hydrophilidæ, I will continue myself with mentioning one more case of the distribution of water beetles being controlled by environment. *Hydrobius tesselatus* is regarded by collectors as exceedingly rare, but wherever a long dead log can be found submerged in slowly moving fresh water, these beetles may be found clinging to the under surface; so Dr. Van Dyke and I found it at Lakehurst, where a rough bridge had been made by throwing logs down side by side across the stream, and Mr. Brownell has told me of a similar experience at Westwood, N. J., where numbers of this species were taken.

In studying Elmidæ we must resort to entirely new efforts in collecting, for they are so securely attached by their powerful claws to submerged stones, sticks and roots that ordinary methods rarely show results. At Yaphank Mr. Davis, Mr. Engelhardt and I waded into the shallow river and carried to the shore pieces of board, branches, etc., that we found in the water, and allowed them to dry out in the sun. On Staten Island and at Ramsey the same plan has been tried, always with the same result, these long-legged beetles commence to crawl away from the unwelcome light and heat and are then easily detected. But in the water or out of it while the stick is wet, they are liable to hide in crevices and defy detection. There used to be a tradition that only swiftly flowing streams contained such beetles, but Mr. Roberts long ago disproved it by finding them in great numbers on the submerged roots of willow trees, growing close to river banks, so that the roots protruded from the soil into

the water. Dr. Lutz has also taken them in numbers by roughly brushing the banks and bottoms of brooks, catching the loosened mud and insects in a piece of cheesecloth stretched across the brook lower down. It is evident that what the Elmidæ require is aerated water, and their formerly supposed dependence upon swiftly flowing streams only results from such being always well supplied with air. The occurrence of *Psephenus lecontei* at Niagara and other waterfalls is simply an extreme instance of this necessity for aerated water.

The difficulty attached to collecting the Elmidæ and perhaps the scarcity of suitable waters near New York have prevented us from doing a great deal with them, even the taxonomy is in a very unsettled condition; some of our local species including possibly one of those found in the Carman River at Yaphank, being still unnamed. The occurrence of some species will undoubtedly be found to depend upon the existence of certain conditions required for their welfare, and it is evident that we have in *Macronychus glabratus* a species that can accommodate itself to the slower moving streams, and is therefore relatively common at least on Staten Island, but we know too little about the other species to venture any comment at present.[1]

Of the other smaller groups of beetles aquatic in some stage, we know still less. We have no Georyssidæ in this vicinity, nor any Hydroscaphidæ. The Dascyllidæ are said to have aquatic larvæ, but no local collector has ever followed the matter up.

COLEOPTERA OF AQUATIC PLANTS.

In the preceding paragraphs we have been principally occupied with insects that frequent aquatic environments primarily for the sake of the water and what it contains, and we have noted in how many respects, in locomotion, in respiration, in vestiture and form they are modified to fit them for aquatic existence. Further, we have been able to discern how for each a special environment suited to its individual needs, is more or less essential to its existence. But in no instance has this environment so far involved special relations with a particular species of the plant world. There are, however, very many beetles living upon aquatic plants, modified to fit them for

[1] A curious statement in reference to Elmidæ is found in E. A. Butler's "Pond Life" to the effect that they occur in great numbers in the Cordilleras and are worked up with dough into lumps and sold under the name of "Chiche," the dish prepared from them being called "Chupe de chiche."

aquatic or semi-aquatic life. Of such the most completely aquatic in habit are found among the snout beetles. *Tanysphyrus lemnæ,* living on *Lemna* and perforating its leaves, *Amalus myriophylli,* on *Myriophyllum, Phytobius velatus,* on *Potamogeton,* and *Stenopelmus rufinasus* on *Azolla,* are nearly all known in both the old world and the new, living indifferently above or below the surface of the water, as adults, and within the tissues of the plants as larvæ. The adults cannot swim, but depend upon the current to float them from one plant to another, and are protected by hydrofuge pubescence for such voyages or for the times when oviposition requires their descending below the surface. Their adaptation to an aquatic existence ends there, and the controlling factor in their environment is really the relation to the food plant. In the case of the larvæ there is even less modification, for as it derives its supply of air from the tissues of the plant on which it feeds, there is no need of special respiratory apparatus. In a very qualified way therefore we may include all beetles feeding upon aquatic or palustral plants, principally because in the adults we shall always be able to note some adaptive modification of vestiture. Such beetles will include the species of the genus *Donacia,* which feed on water lilies, pickerel weed, *Sagittaria,* and various other aquatic plants and sedges, the name itself being derived from *Donax,* a reed. In the case of those feeding on water lilies the larvæ feed on the rootlets three or four feet below the surface of the water, being provided with sharp anal appendages for the better piercing of the air cells in the plant (not on the stems as has been stated). I have found on roots dragged out of the mud at the bottom, leathery cocoons, which in winter contain larvæ and in early spring pupæ, from which the adults have later hatched. McGillivray has given excellent details and figures of these insects. Although the adults remain above the surface of the water and deposit their eggs on leaves at the surface, the other stages are thus spent below the surface. The allied genus *Hæmonia* is even more aquatic than *Donacia,* it lives on *Potamogeton,* goes below the surface to oviposit and has proved capable in captivity of living submerged for many weeks. Brocher has experimented with the European species which is provided with the peculiar pubescence described above, as capable of maintaining a thin sheet of air about the body, thus permitting the insect to remain long below the surface instead of resting on aquatic foliage like

Donacia. A considerable number of snout beetles besides those already mentioned attack aquatic plants and should be included. *Listronotus latiusculus* was found by Dr. C. M. Weed in all its stages in the stems of *Sagittaria variabilis; L. appendiculatus* by Mr. W. Jülich, in the stems of reeds; *Macrops solutus* and *sparsus* also breed in the stalks of *Sagittaria.* Some species of Lixus have been bred from stems of *Polygonum amphibium* by Popenoe, *Lissorhoptrus* lives on the roots of rice, and the various species of *Sphenophorus* also infest the roots or lower parts of the stems of graminaceous plants, including those that grow in wet places. These Rhynchophora are here included because their surface indicates an adaptation to aquatic conditions, being clothed in every instance with hydrofuge pubescence or with imbricated scales. These are but a few instances of beetles dependent upon plants growing in water. Many others could doubtless be cited by those collectors who have specially studied ponds and swamps, and much remains to be learned in regard to the food plants of our local palustral Coleoptera.

SPECIAL QUESTIONS.

As to salt or brackish water, I think it may be said that at best it is tolerated by beetles. *Philhydrus hamiltoni* seems to be a denizen of salt marshes exclusively, but all the genera and most of the species of Hydrophilidæ found there would also be found elsewhere and in greater numbers. In other families I know of no salt water species. The difference between stagnant and moving water is on the contrary very marked in its influence. The Parnidæ and Elmidæ, which are comparatively stationary, must depend upon the current bringing them air, hence practically none are found in still water. Most of the Hydrophilidæ feed upon decaying vegetation, and would be ruined where a swift current kept the bottom clean, hence the members of this family are seldom found in moving water; but there are all degrees of motion, and between a stagnant ditch and a slowly moving swamp the difference in respect of motion is not great, and leads up so gradually to the slowly moving streams of flat plains that one is not surprised to find Parnidæ and Elmidæ in sphagnum bogs or *Hydrobius* beneath submerged bridge logs. As I have before pointed out a moderate degree of flexibility in habits will tend to broaden the distribution of a species, while the converse would go far towards entering it in the

class of rare or local species, and there is a great difference between species in respect of flexibility, as I have shown in treating the distribution of *Cicindela.*

The influence of light and shade appears to be marked in the case of *Agabetes acuductus,* found only in woodland pools, but in general the amount of light which penetrates the water must be so reduced that its further diminution by the shade of trees cannot be of great importance.

The Gyrinidæ circling about the surface of the water in broad daylight shun the light less than most aquatic beetles, which will usually be found during the day among the mosses and leaves or hiding in the banks.

Temporary pools afford little in beetle life, and were it not for the beetle's nocturnal errors, would perhaps contain nothing. As a rule the presence of vegetable or animal matter, food of some sort, is a positive requirement for successful water beetle fishing. Given food even the lowest temperatures seem of little consequence; I have seen water beetles swimming beneath transparant ice thick enough to bear my weight, and Mr. Engelhardt can bear witness to the numbers that we found in the bitter cold pools of Labrador. No beetles were there more numerous than the water beetles.

In conclusion it seems to me that while the environment may be somewhat varied for many species that are capable of adapting themselves to varied conditions, the species that might perhaps be called the common species, the environment for others, the so-called rare species, must be exactly right or they cannot maintain their existence. And even for such, an element of accident also comes into play, for such beetles are often missing where the environment is found. Every lily pad does not support a *Donacia.* In traveling to Staten Island once via New Jersey trolley road, I was told that the trolley car connected with a boat for Staten Island. Arriving at the terminus, no boat was in sight, nor did one appear for a long time, so the environment being right and the boat missing I questioned the dock man, and learned that there was "a car agin every boat but not a boat agin every car." So the student of environment must not be discouraged by apparent failure to connect the beetle with the environment, but remember that there is not always a "boat agin every car."

SOME HABITS OF THE DYTISCIDÆ.*

By JOHN D. SHERMAN, Jr.,

BROOKLYN, N. Y.

The animal fauna of the water is said to be largely controlled by the character of the water bottom.

The Dytiscidæ, according to my experience, do not like very muddy bottoms. A few of our commonest species do occur in such bottoms, and in abundance, *e. g.*, *Hydrovatus cuspidatus* Germ. and *Cœlambus inæqualis* Fabr.

But the number of these species is small, and ponds and brooks of the most promising appearance otherwise, but with very muddy bottoms, are usually very disappointing when you are looking for *Dytiscidæ*. These beetles prefer for their home bodies of comparatively clean live water, either spring-fed ponds or running brooks, where the bottom is at least moderately clean or sandy.

The presence of some vegetation, preferably small plants—especially those of a filamentous character, or submerged roots—is indispensable.

The almost absolutely clear mountain or forest lakes of the Lake Superior region contain little plant life at their borders, a fact which has been attributed, in the case of the larger lakes, to their greater exposure to the ice. They apparently contain few if any beetles. In the White Mountains of New Hampshire within a few miles of each other are five small "lakes," of approximately the same size at about the same elevation: the twin Carter Lakes, 3,150 feet high, Hermit Lake and Glen Lake in Tuckerman's Ravine, 3,700 feet, and Spaulding Lake in the Great Gulf, 4,150 feet. All of these except Hermit Lake are very clear and practically without either vegetation or beetles. Hermit Lake is rich in both, while Glen Lake, only a quarter of a mile distant, contains neither.

If the water is polluted, as for example by the presence of carrion, the Hydrophilidæ take precedence over the Dytiscidæ. On the other hand the presence of decomposing vegetable matter, such as dead and

* The new names suggested in this paper for certain well known species of *Hydroporus* will be more fully explained in a later paper, together with other notes and descriptions of new species.

even thoroughly decayed leaves, does not interfere with Dytiscidæ.

In the larger bodies of water it is very difficult to locate any beetles, and in them, whether swamps, ponds or rivers, the beetles seem to occur only in very limited spots which are usually separated from the main sheet of water, such as the eddies or the small pools along the shore. In fact the small water bodies are always best, and the time most favorable for collecting is when the water is low or almost dried up.

Comparatively wild regions are better than such finely and thoroughly cultivated places as say the Cumberland Valley in the vicinity of Chambersburg, Pa., or the big farms about Saint Paul and Rochester, Minn. In New Jersey and New York and Massachusetts and Virginia, where there are occasional wild spots scattered about, the Dytiscidæ are more plentiful. Mr. Schwarz once told me that he considered the presence of cattle unfavorable for Dytiscidæ, but Mr. Roberts did not find it so in his collecting in Bennington Co., Vt. If there are fish there are not so many beetles.

These water beetles are well known to be excellent flyers and are often attracted by electric or other lights. Correspondents in the Winnipeg region have written me of the hordes of *Dytiscus* which fly to the lights early in the spring and in the late autumn. *Cybister fimbriolatus* Say is often taken at lights hereabouts, while *Erctes sticticus* Linn. and *Laccophilus quadrilineatus* Horn are taken in this way at McPherson, Kans., by Mr. Knaus. Mr. Fuchs in California collects many water beetles, especially the Hydrophilidæ, at light, and so does Mr. Loding at Mobile, Ala. They are also collected at light in the desert regions, great distances away from any known water supply.

While mentioning these flights of water beetles it is worth while to recall Dr. Régimbart's interesting paper (Annals Ent. Soc. France, 1894) on Dytiscidæ found in the debris of tobacco leaves. About 50 species were listed, 17 of these being described then for the first time. These beetles and numerous species, nearly all small, of other families, were gathered from dried tobacco leaves through the efforts of Mr. Antoine Grouvelle, director at that time of the National Tobacco Monopoly of France. Dr. Régimbart stated that these insects were probably intercepted in their flight by the pubescence and stickiness of the tobacco leaves. It is also possible, he said, that some were

attracted by the rain water resting in the axilla of the leaves, and that others originated in the water with which the leaves were washed. The *Dytiscidæ* were chiefly of the genera *Canthydrus, Bidessus, Laccophilus, Desmopachria, Notomicrus, Hydrovatus, Celina,* and *Hydrocanthus,* as the tobacco came from southern countries. Two North American species (from Mexican tobacco) were mentioned—*Bidessus affinis* Say and *Bidessus pullus* Lec.

The Dytiscidæ are also often washed up on the ocean beaches and on the shores of the Great Lakes, by tide or wind, though none of the species live either in the ocean or in the open waters of the big Lakes.

Few species live in salt or brackish water. A few are often found in it, though most of such species occur also in water which is not salt or brackish. *Cœlambus impressopunctatus* Sch. is taken on the salt marshes of Staten Island, but this is a widely distributed species in the north, occurring both at the sea level and at high altitudes, both east and west. Mr. Loding, of Mobile, Ala., mentions *Coptotomus, Laccophilus proximus* Say and *fasciatus* Say, and *Thermonectes basilaris* Harr. as occurring in brackish water, and says the latter also lives in quite saltish water. The lately rediscovered *Agabus lineelus* Lec. lives in the salt marshes near San Francisco, Cal.

In an inlet of the Hudson River just below Peekskill, New York, where the river water is still salt, under stones, sticks, dead leaves or other debris on the mud at or below the high tide mark, *Copelatus glyphicus* Say used to be very common. This species is associated by Mr. Leng with cat-tails and he points out that with its thin flat body, it is well adapted to live among the cat-tail sheaves. The place near Peekskill was covered with an extensive growth of cat-tails. I believe Mr. Bischoff of Newark finds a number of species of Dytiscidæ in the cat-tail sheaves early in the spring, which have hibernated in this shelter.

Celina angustata Aubé occurs in some ponds on Staten Island where there is some iron in the water, and Mr. Shelford found some species in similar ponds near Chicago, Ill., but usually if the percentage of iron is great there are no beetles, *e. g.*, the pools along the eastern branch of the Potomac at Bladensburg, Md.

Dytiscidæ live both in very cold and in very warm water. Mr. Schwarz has taken *Deronectes striatellus* Lec. in water having a

temperature of 105 degrees Fahr. (and some Hydrophilidæ in still warmer water) while *Deronectes griseostriatus* De G. swarms in the icy springs or "lakes" above the tree line in the White Mountains, and in Labrador. As a rule, the species of *Cœlambus, Hydroporus, Ilybius, Agabus, Colymbetes* and *Dytiscus* are most abundant in colder climates, while *Canthydrus* and its allies, *Laccophilus, Hydrovatus, Celina, Copelatus* and *Cybister* are best represented in warmer regions.

Excluding the very large bodies of water—the large rivers, the big lakes, and the extensive swamps,—which, as before stated, are not favored by the Dytiscidæ, the various water bodies may be conveniently discussed, with reference to these beetles, under the following four heads.

I. The pond of the open meadow.

II. Ponds and pools of the forest with *sphagnum* as the characteristic living plant form, and dead and rotten leaves for a bottom.

III. Running brooks or small rivers.

IV. Small springs or wells.

I. The Meadow Pond.

This is the ordinary hunting ground of the collector. The other places are quite commonly neglected.

The Dytiscidæ living in the typical meadow pond are well described by Professor James G. Needham in his paper in the American Naturalist, August, 1907, in which is given a list of 29 species found in the "Gym" pond on the campus at Lake Forest, Illinois.

This pond is described as an artificial one, made by damming a short spring-fed brook, in which after several years conditions have become quite natural. The pond is about 200 feet by 100 feet, 15 feet deep near the dam, and shallow at the other hand, where it is filled with a dense clear growth of cat-tails (*Typha*), with very little other vegetation anywhere in the pond. The Dytiscidæ are found in the limited area of the typha beds.

The species listed are our common species of *Laccophilus, Hydrovatus, Bidessus; Cœlambus inæqualis* Fabr., *dispar* Lec., *acaroides* Lec., and *nubilus* Lec.; *Hydroporus undulatus* Say, *dichrous* Melsh. and *modestus* Aubé; *Ilybius confusus* Aubé; *Coptotomus interrogatus* Fabr.; *Agabus subfuscatus* Shp., and *disintegratus* Crotch; *Hydaticus piceus* Lec., *Acilius semisulcatus* Aubé and *fraternus* Harr., *Dytiscus*

hybridus Aubé, *Thermonectes basilaris* Harr., *Graphoderes cinereus* Linn., *Colymbetes sculptilis* Harr. ,and *Rhantus notatus* Fabr.

Almost the same species occur in similar meadow ponds in the vicinity of New York City. *Cœlambus acaroides* Lec. and *Rhantus notatus* Fabr., however, are western species exclusively. The genus *Rhantus* is commonly represented here by *binotatus* Harr. Two genera not mentioned by Needham contribute two common species to the meadow pond fauna, *Hydrocanthus iricolor* Say and *Desmopachria convexa* Aubé.

Needham calls attention to the general correspondence in the size of the various species with the depth of water in which they are found, *Dytiscus* being usually found in the deep water—two or three feet,—with *Acilius* adjacent on the shoreward side, and *Coptotomus* "in water a foot deep in the narrow aisles between the typha clumps. *Laccophilus* dwells amid the fallen stems and trashy accumulations nearer shore, *Hydroporus* and *Cœlambus* love the shoals into which one can look down while sitting on the bank, while *Bidessus* clings to the very shore line."

The Lake Forest pond is considerably larger than the ponds in which I have been most successful. Nor does the limitation of vegetation to the typha type sound especially attractive.

A collection of smaller ponds somewhat connected, and located in wilder country, like the ponds at the edges of the woods near the railroad trestle of the C.•R. R. of N. J. crossing the brook a mile and a half north of Lakehurst, N. J.—ponds first explored by Mr. Leng and now familiar to us all—such a group of ponds provides an ideal home for the Dytiscidæ. About 40 species live in these Lakehurst ponds. *Cœlambus farctus* Lec. replaces *acaroides* Lec. of the Lake Forest list while *Rhantus* is represented by *calidus* Febr.—a more southern species.

In *Agabus* we have at Lakehurst *tæniolatus* Harr. and *æruginosus* Aubé. The presence of this genus suggests in each case the spring-fed nature of the ponds. In *Bidessus* there are *pulicarius* Aubé, which becomes commoner as we go further south, and also *fuscatus* Crotch, the latter being usually a forest species in the north. The genus *Canthydrus* is also represented at Lakehurst.

Canthydrus puncticollis Crotch, which has been considered a rare beetle, was found last May by Mr. Norman S. Easton at Fall River,

Mass., on pieces of old lumber in a small pond bordered on one side by cat-tails and pickerel weed, with meadow land on the shore; and on the other side full of sawdust and old lumber from an ice-house, with a wooded swamp further back.

Irrigation ditches are favorite places for collecting water beetles in many regions where there are few other collecting grounds, and under these conditions yield an abundance of species and specimens especially if there is some motion to the water.

II. Ponds and Pools of the Forest.

In these the number of species is much smaller, but several of them seldom occur anywhere else.

My own favorite locality of this type at Peekskill, New York, where Mr. Roberts and I have collected so successfully, may be described as a swampy depression in the woods, a few hundred feet above sea-level, filled with several small ponds more or less connected. These ponds have for a bottom a deep bed of dead and thoroughly decomposed leaves, but contain very little living vegetation except some *Sphagnum* and in some spots a little grass. The woods are thick enough so that the ponds are moderately well shaded. There used to be a somewhat similar region in the woods adjoining the Moravian Cemetery at Middletown, Staten Island, and there are similar but smaller pools near the Great Falls of the Potomac on the Virginia side.

In all three places practically the same species occur as follows: *Bidessus fuscatus* Crotch, *Cœlambus laccophilinus* Lec., *Hydroporus tristis* Payk., *Hydroporus difformis* Lec., *Ilybius ignarus* Lec., *Matus bicarinatus* Say, *Agabetes acuductus* Harr., *Agabus semipunctatus* Kby., *Rhantus sinuatus* Lec.

The shaded ponds in Forest Park, Long Island, formerly furnished some of these species, but lately these ponds have become contaminated and most of the vegetation has been destroyed, so that this fauna has largely disappeared.

While the living vegetation of these forest ponds is not extensive, the little there is, seems to be essential. At Peekskill last year we found that the vegetation had been mostly killed perhaps by the drought of 1911, and water beetles were extremely scarce. At Peekskill too, the forest is gradually disappearing, and with it, no doubt, these Dytiscidæ also.

In the same woods at Peekskill, in isolated deep spring-like pools full of dead leaves, *Agabus gagates* Aubé is a common species and practically the only one found in them.

In more open spots in the woods at Tyngsboro, Mass., the ponds contain *Hydroporus tenebrosus* Lec. and *despectus* Sharp, and *Ilybiosoma bifaria* Kby. as well as several other species.

In still more primitive forest growths than the Peekskill one—in the sphagnum pools like those at the upper end of Hermit Lake 3,700 feet high on the east side of Mt. Washington, N. H.—and in the very similar pools near the shores of the small lakes in the vicinity of the Huron Mountain Club, on the south shore of Lake Superior, we find

Scutopterus angustus Lec.	Both places.
Scutopterus Horni Crotch	Lake Superior.
Ilybius pleuriticus Lec.	Both places.
Ilybius discedens Sharp	Both places.
Agabus anthracinus Mann	Hermit Lake.
Agabus inscriptus Crotch	Hermit Lake.
Agabus semipunctatus Kby	Both places.
Hydroporus tristis Payk.	Both places.
Hydroporus n. sp. near *despectus* Sharp	Hermit Lake.
Dytiscus dauricus Gebl.	Hermit Lake.

The common species of *Sphagnum* at Hermit Lake is *Girgensohnii* Russ. of the *S. acutifolium* group, as kindly determined by Dr. Andrews through Mr. Davis.

Of the forest pond Dytiscidæ cited in these two tables, *Hydroporus tristis* Payk. is quite often found in the more open ponds, while *Ilybius pleuriticus* Lec. occurs in the Glen mill pond near Glen House, N. H., about 1,600 feet elevation, and *Agabus anthracinus* Mann. was very common one season in the Watson ice pond near the Ravine House in the meadow at Randolph, N. H., 1,300 feet high.

Two of our eastern species of *Ilybius*—*confusus* Aubé and *biguttalus* Germ.—live in meadow ponds; *pleuriticus* Lec. lives both in meadow and in forest ponds, while *ignarus* Lec. and *discedens* Sharp seem to be forest inhabitants only.

The other forest water beetles mentioned are very seldom seen out of the woods.

This fact is easy to explain in the case of *Agabetes acuductus*

Harr., which is without wings and a very awkward beetle out of the water. Several of the species lack the agile swimming powers of most *Dytiscidæ*. *Hydroporus difformis* Lec., *Matus bicarinatus* Say, *Agabus semipunctatus* Kby. and even the big *Scutopterus*, are very deliberate in their movements and may be said to crawl rather than anything else.

Many of these forest species seem able to live where there is little actual water, provided there is some moisture. Wickham in his list of Bayfield, Wis., beetles says "a large part of the species of water beetles were taken not in water, but under moss in damp spots, a peculiarity which I have noted in some species of *Agabus* collected on a previous trip to Alaska." Adams refers to this in his book on Isle Royale. Shelford one year found *Matus bicarinatus* Say quite common under old logs in damp places at Pine, Ind., and Mr. Loding in Alabama says of this beetle "always under sphagnum moss in a moist partly dried up swamp."

The water-beetles of the forest are for the most part black or dark in color, especially those species living in the deepest and darkest woods. The very black rich earth of their habitat, and the comparative lack of sunlight, undoubtedly affect the coloration of the beetles, as is commonly believed. The species living in open meadow ponds are much oftener pale in color or markings, *e. g.*, *Hydrocanthus*, *Laccophilus*, *Cœlambus*, *Coptotomus*, *Rhantus binotatus* Harr. and *calidus* Fabr., *Colymbetes sculptilis* Harr., etc.

III. BODIES OF RUNNING WATER.

While the Parnidæ live almost exclusively in running water, the number of species of Dytiscidæ so found is small by comparison with the number living in ponds. But these species are very interesting and indeed seem to possess a certain nobility of appearance, nearly all of them being very bright, shining and clean looking. As Dr. Régimbart advised his correspondents, "they live usually along the edges of shallow streams, nearly always in small brooks in whose beds are stones, and along whose edges there are masses of the half floating roots of aquatic plants."

The genus *Hydroporus* furnishes most of the species of Dytiscidæ found in running water. Of this genus *pulcher* Lec., *mellitus* Lec., and *striato-punctatus* Melsh. live in the shallow places of the smaller

peaceful brooks with clean sandy bottoms, like the one running through the golf course near the Moravian Cemetery on Staten Island.

Shelford took *Hydroporus mellitus* Lec. in great quantities at South Haven, Mich., "in the sand near the edges of very shallow pools left in a partly dry brook, waiting several minutes for the beetles (which are exactly the color of sand) to crawl out."

Hydroporus vittatus Lec. was also found by Shelford in abundance in the gravel at Edge Brook, Ill., near the shore of the old course of the Chicago River. This gravel was full of filamentous algæ. I first saw this beautiful beetle alive at Chester, Minn., in a small sandy pool left in the almost dried up bed of a good sized brook, and a few days afterward I accompanied Professor Shelford's class on one of their memorable picnics to the Edge Brook locality and took a great many more.

Hydroporus concinnus Lec. (*wickhami* Zaitzev.) I have usually found in brooks where cress was growing, brooks usually with muddier bottoms.

Hydroporus spurius Lec. lives among the submerged roots of plants living on the banks of deeper and larger brooks.

Hydroporus solitarius Sharp also lives in the larger brooks or small rivers (Pine River, Lake Superior; Ten Mile River, Wingdale, New York; Black Creek, Esopus, New York).

Hydroporus septentrionalis Gyll. has been found rather common in recent years by Messrs. Sheriff and Frost at Fabyans, N. H., in the Ammonoosuc River, which is a rapid stream at that point. Mr. Sherriff says that "it confines itself to the water's edge, hiding under submerged stones."

Hydroporus cimicoides Sharp and *venustus* Lec. are two more species of this genus living in running water. Both of these are abundant in the clean sandy pool and brook flowing therefrom, at the bottom of the lake dam at Lakehurst, N. J.

Dytiscidæ of other genera also occur in running water.

In the eddies of the eastern branch of the Potomac River at Bladensburg, Md., and also in the brook running through my uncle's farm at Ash Grove, Va., are found the beautiful *Laccophillus* described in manuscript as *Schwarzi* by Mr. Roberts and also the fine undescribed *Hydroporus* to which I propose to give Zimmermann's mss. name of *dilatatus*.

In a brook in the woods at Marion, Mass., Mr. Bowditch and his friends find *Agabus gagates* Aubé in great numbers and deeper, among the submerged roots, the less active *Agabus planatus* Sharp. In my own experiences at Marion *gagates* outnumbered *planatus* about a hundred fold.

Another common brook species of *Hydroporus* both at Marion, Mass., and Ash Grove, Va., and elsewhere, is the beetle which has passed so long in collections as *vitiosus* Lec. and which was described under this name by Dr. Sharp, although it is really quite a different species for which I shall suggest the name *blanchardi*.

Deronectes depressus Fabr. and *Haliplus cribrarius* Lec., as well as *Hydroporus solitarius* Shp. occurred in the bed of the small "river" between Mountain Lake and Cliff Lake in the Huron Mountain region of Lake Superior, where the current is quite strong, the water being perhaps two or three feet deep and full of eel-grass.

Amphizoa lives in the swift mountain streams on the Pacific coast. So does *Hydrotrupes palpalis* Sharp, according to Fall.

Our smallest Dytiscid, *Notomicrus nanulus* Lec., is another interesting species living in running water, found by Mr. Schwarz in midsummer on the underside of logs swept against a bridge over the Pell River at Bartow, Fla.

One of the meadow pond species mentioned by Needham, *Cœlambus acaroides* Lec., lives also in the brook at Edge Brook, Ill. In July, 1911, I collected this species a few days apart, in a muddy pond near St. Paul, Minn., and at Edge Brook. The brook specimens were clean and bright; those taken in the muddy water were dark and dirty in appearance. This species and *Agabus gagates* Aubé are two of the very few brook species which are also at home in still water. The species of the genus *Agabus* however are more properly to be considered as belonging to the fauna of springs.

Sometimes, however, these brook species are carried away by freshets from their home and found elsewhere. An interesting instance of this came under my observation in August, 1903, when we were camping on Esopus Island in the Hudson River. The very heavy rains of that month converted into a torrent Black Creek which empties into the river opposite the island, and hundreds of specimens of *Hydroporus pulcher* Lec. were swept half way across the Hudson River to the shores of the island, where they were found under stones and pebbles at low tide.

On the other hand, in very dry seasons, when even the larger brooks and small rivers are almost dry, with only pools remaining in many portions of their beds, a great many of the ordinary pond species resort to these places, and at such times nearly all the native species are found in them.

IV. SPRINGS.

Characteristic species of the small springs in the north are *Agabus parallelus* Lec., *obtusatus* Say, *erythropterus* Say, and other species of the genus *Agabus*, while in *Hydroporus* we have *stagnalis* G. & H., *persimilis* Crotch, *oblitus* Aubé and their allies.

Agabus semivittatus Lec. usually lives in springs or along brooks where cress grows. Shelford first advised me of always finding this species under such conditions at South Haven, Mich., and I have since observed it occurring with the same plant in the Cumberland Valley, Pa., and at Rochester, Minn. Mr. Loding has a record of this or a closely allied species under sphagnum moss in a dried-up pond at top of Blount Mountain, Ala., 1,000 feet elevation.

On the Pacific coast *Agabinus glabrellus* Motsch. lives, according to Fall, in very cold mountain springs.

The genus *Siettitia* was erected for a beetle of the *Hydroporus* type found in France at the bottom of a deep well and *Hydroporus stagnalis* G. & H. occurs here in very deep spring holes which have been built up into the form of a well.

The small so-called "lakes" of the White Mountains, above the tree-line, have been to me an exceedingly interesting collecting ground and are I think entitled to some separate mention. These "lakes" are virtually large springs among the rocks usually lined with *Sphagnum*, or sometimes with grass. They seem never to fail to shelter an abundance of beetles, of which six or seven species do not occur below the tree-line. These strictly boreal species (*Hydroporus morio* Sharp; the beetle described by Sharp as *Hydroporus signatus* Mann., but in reality another species for which I suggest the name *appalachius; Deronectes griseostriatus* DeG.; *Agabus congener* Payk., and *tristis* Payk.) are often represented by hundreds of specimens.

Besides these boreal species, some thirty-five or more others are represented by occasional examples, of which no doubt many are simply visitors from the lower slopes and valleys just as the other

beetles which, when climatic conditions are just right, fly, or are carried by the wind up to the summits where they are found in the buildings or under whatever shelter offers at the top.

While I have not personally been successful in collecting in the merely temporary rain pools on the summit of Mt. Washington, presumably because it is too late, in September when I have been there, to expect these insect flights, Mrs. Slosson and others have taken many species of Dytiscidæ in them.

But the various "lakes" of the 5,000 foot level along the Presidential Range,—the Lakes of the Clouds on Mt. Washington; Starr Lake, smaller and more shallow in the col between Mt. Adams and Mt. Madison; Storm Lake, a mere puddle in the rocks on Mt. Adams; Peabody Spring, close to Storm Lake; and Spaulding's Spring on the side of Mt. Jefferson,—have never failed me, however cold or disagreeable the weather, and collecting in this region, with its rich yield of interesting species and with such a glorious setting of natural scenery on all sides, seems to me to be just about ideal.

ENVIRONMENT OF HYDROPHIDÆ.

By FRED. WINTERSTEINER,

LONG ISLAND CITY.

While all Hydrophilidæ except the sub-family Sphæridiini (which live on decaying plants or manure) are aquatic, swimming ability is found only in the genera *Hydrous, Tropisternus, Hydrophilus* and *Berosus,* the others crawling on submerged vegetation or clinging to various submerged objects. They exhibit a uniform dull coloration varying from piceous to testaceous, with very few exceptions, as in *Hydrobius tesselatus* and certain species of *Tropisternus* and *Berosus,* or in the dull cuprous tinge of some Helephorini. The underside of the last named is provided with a pubescence, retaining air which modifies their specific gravity and causes them to float to the surface, ventral side upwards, when the vegetation to which they cling is sufficiently disturbed to break their hold. According to European authors eggs are laid in cocoons, which in *Hydrous* and *Hydrophilus* float freely on the surface of the water, while in *Hydrobius*

and *Philhydrus* they are attached to plants and in *Helochares* are carried on the abdomen until hatched. The cocoons are formed by the secretions of two glands discovered by Stein.

Differences in color in *Helophorus* may be caused by the surroundings; darker specimens are found late in the fall by sifting and collecting in the woods, while lighter ones occur more in the open field. The species prefer sandy shores of slow running water, but are also found in stagnant water.

I was fortunate enough to capture one specimen of *Ochthebius foveicollis* Lec. for the first time in New Jersey by sweeping in clear stagnant water on *Myriophyllum*. Most of the species are Pacific and are said to prefer clear, running, shallow water, in which they may be found adhering to the underside of stones, preferably those partly out of water. Frequently they are found in small colonies.

The species of *Hydræna* are found here in stagnant water, but in California are said to occur in clear brook water, not under stones but in sand.

THE RELATION OF MOSQUITOES TO THEIR ENVIRONMENT.

By JOHN A. GROSSBECK,

NEW YORK, N. Y.

So far as known all mosquitoes are aquatic in their larval and pupal stages. Only a comparatively few, however, are able to exist for an indefinite period beneath the surface of the water, nearly all being forced to rise periodically to the top for a supply of oxygen. For this purpose a tube of varying length, according to the species, has been developed in the larva, and a pair of them, differently placed however, in the pupa. These tubes are in nearly all species thrust through the surface film and oxygen is obtained by direct contact with the outer air. In a few species, only one of which is found in the vicinity of New York, these tubes have become modified for a wholly underwater life. In these the tubes are so constructed that their tips may be inserted into the roots of plants and air obtained from or through the plants. In addition to the tube the larva is provided with four tracheal gills situated at the anal end of the body, and in a very

general way the larva is able to remain below the surface of the water for a greater or lesser period of time according as these organs are long or short. Thus, for example, the ordinary species of *Culex* (*sens. lat.*) have them of moderate length and remain beneath the water usually for about a minute; *Anopheles,* particularly *crucians,* and some of the less common species of *Culex* have them shorter and remain for a more brief period beneath the water; while *Culex dupreei* and *discolor* have them greatly developed and are in consequence capable of remaining under the water to all appearances indefinitely, though both are occasionally seen at the surface. In these latter cases the air-tube has become weak and is probable almost functionless. In *Wyeomyia smithii,* which remains under water during practically its whole larval life, two of the gills are greatly dilated while two are very much reduced in size.

There are probably no other insects which spend the whole of their early stages in water that pass through these stages so quickly as do the mosquitoes and in consequence these latter are able to utilize pools which would be quite too transient for other insects. A puddle in a wheel rut can and frequently does bring a brood of mosquitoes to maturity. But despite the fact that only a little water is required for their development, and that when experimentally removed from their place of birth the larvæ mature normally and in due season provided the water supplied them has a sufficient quantity of organic matter in it, the species under normal conditions are found in particular environments.

Our best known species, *Culex pipiens,* has very appropriately been called the domesticated mosquito by reason of its being invariably found around the habitations of man. Foul water seems to be its natural breeding place. Clear water however quiet and otherwise suitable is never selected. Sewage collected in a gutter, pails containing liquid manure, cesspools, rainbarrels, especially when but little water is at the bottom, are favorite breeding places. A small pond may be free from them except where refuse has been thrown in. And it is a noticeable fact that ordinary muddy water or such as becomes more or less polluted through natural agencies, as through dying vegetation, is not used as a breeding place. Pass beyond the limits of the village and city and *Culex pipiens* is no longer found, its place being taken by an allied species (*Culex restuans*) more

addicted to a clean water environment. *Restuans,* however, with one or two other species is not uncommonly found in the same situations as *pipiens.*

The salt marsh is an environment to which five species in this region confine themselves for breeding purposes. The mosquito fauna of the salt marsh is distinctive, none of the species living on it in the larval stage breeding anywhere else. *Culex sollicitans* is always the most abundant and is found in practically all the temporary pools uninhabited by fish. With it is found *Culex tæniorhynchus* and *Culex cantator.* The latter prefers those areas which merge into the fresh water marsh, such, for instance, as occur along rivers, rather than those which border the bays; but never is it found in strictly fresh water swamps. *Culex salinarius,* a not remote ally of the house mosquito, is the fourth species found on the salt marsh, and *Anopheles crucians* the fifth. The first three of these five species are migrants and are frequently found for many miles inland and away from the salt marsh, but never have the larvæ been found in fresh water pools. That the salt water is not a prerequisite for the development of the larvæ is evidenced by the fact that eggs of these species will hatch and the resulting larvæ mature in water that is absolutely fresh.

Another environment is the temporary pools of open fields, the more shallow open swamps which usually consist of a series of temporary pools more or less connected, and the shallow edges of ponds subject to the rise and fall of the water. These situations are all very similar when looked at from the mosquito-breeding standpoint, and contain practically the same species of mosquitoes. Thus *Culex sylvestris* is found in all of these places, though in smaller and more scattered numbers in the ponds, due probably to the greater struggle for existence. *Culex trivittatus, C. jamaicensis* and *C. discolor* are found in the same places, but to a less extent at the edge of the ponds. *Psorophora ciliata* occurs usually only in clear pools of the most transient character and two species of *Anopheles,* namely, *punctipennis* and *maculipennis* usually occur in such of these places as are to some extent overgrown with vegetation. The first of these two is occasionally found in pools with a clayey bottom and no vegetation, and in places inhabited by *Culex pipiens* but these are exceptions not often found. *Maculipennis* is more given to inhabiting pools and swampy regions at the edges of the woodland, or more rarely in the woodland itself.

In the colder and clearer parts of open swamps *Culex restuans,* occasionally found with *C. pipiens* as above mentioned, and *Uranotænia sapphirina* is often found; but *Uranotænia* together with *Culex perturbans* is more often found in permanent swamps. *Culex melanurus* occurs only in those places where the water is very cold and spring-like. Just why these species confine themselves to these environments is not known, but the fact that most of the species are able to maintain themselves well under other conditions would seem to indicate that the preferred environment is not important to the well-being of the species.

Passing from open fields and swamps to the woodland a totally different set of species are encountered. Most of these breed in the temporary pools formed by spring rains and melting snows, and frequently half a dozen or more species may be found in one pool. Approximately in the order of their abundance these species are: *Culex canadensis, C. abfitchii, C. subcantans, C. pretans, C. abserratus, C. musica, Ædes fuscus, C. sylvicola, C. dupreei, C. fitchii, C. pallidohirta, C. nivitarsis* and *C. inconspicuus.* Three others, *Culex aurifer* and *C. dyari,* so far found only in the woodland in the larger and more permanent bodies of water, and *C. saxatilis,* which has been found only once in a rock pool may be added. Three more are found normally in the woodland in very restricted situations. These are *Culex triseriatus, C. signifer* and *Anopheles barberi* which breed in the water contained in tree hollows. And another species which may be as much attributed to the woodland as to the more open swamps and which is even more closely associated with a particular environment is *Wyeomyia smithii,* the pitcher plant mosquito which has never been found breeding except in the leaves of the species of *Sarracenia* and of some orchidaceous plants.

The question that arises then is: What are the factors that more or less closely limit the distribution of these various species to their environment? We will briefly consider some of the conditions which influence mosquito habits.

It was at one time believed that all mosquitoes laid eggs in a similar manner—namely, in a boat-shaped mass which floated on the surface of the water. It is now known that eggs are laid in several different ways and that the conditions suitable for oviposition for one species is not suitable for another. Thus of the species around New

York *Culex pipiens, restuans, salinarius, melanurus, perturbans, territans,* probably *saxatilis,* and *Uranotænia sapphirina*—eight in all—deposit them in rafts. In order to insure safety to the larvæ two things must be observed by the parents: running water must be avoided, else the eggs will be washed away, and if in no other way destroyed by being carried to those ever ready for so dainty a morsel as an egg boat; and, the eggs must be deposited in a nook already comparatively free from enemies. Thus, these species are limited first to quiet water, and second to protected places in that quiet water. With regard to this latter nothing can be better than a pool so transient in character as to exclude the breeding of practically all other insects. When this can not be had the edges of shallow bodies are selected, particularly where protected by vegetation, rocks or debris. Such conditions are suited to most of the species in the egg-boat category, but other as yet unknown reasons induce some to select the fouler water (*pipiens*) and others (*restuans, territans,* etc.) the cleaner water. One species (*salinarius*) will select only salt water, and three others only permanent bodies of fresh water. The reason for the selection of permanent bodies in two instances (*perturbans* and *melanurus*) is known: the larvæ pass the winter in the larval stage and hence any water which would disappear during the fall or winter would cause the larvæ to perish. With *Uranotænia sapphirina,* the third species, the reason for the selection is not apparent.

The species which deposit their eggs singly may be placed in two distinct groups: those that deposit their eggs on the surface of the water and those that deposit them in the mud in depressions likely to be water filled. Only three species are positively known to have this last mentioned habit, all of them occurring on the salt marsh. It is well known that the salt marsh is subject to periodic inundation and desiccation. After such an area has been flooded all the pools are filled with larvæ, and a week or two later the adults emerge; but egg-laying does not begin until the meadow has become largely dry, when the mud is littered with eggs which remain unhatched for a month or a year, or several years if necessary, until covered by water, when the young larvæ emerge.

Many species are known to lay their eggs singly on the surface of the water but the group consisting of these species may again be divided into those of which the eggs hatch in a day or two as in the

species of *Anopheles*, and those of which the eggs sink and remain at the bottom unhatched for almost a year as in *Culex subcantans, pretans, abserratus*, etc. The former division, which continues to breed throughout the summer, usually selects the more permanent open swamps; the latter division selects woodland pools which last only during the spring months.

Vegetation in the water has much effect upon the mosquito life in it. Thus except in the most temporary rain pools mosquito larvæ and pupæ in water free from plants would be exposed to the attacks of many enemies and so be unable to maintain themselves. Vegetation serves as a protection to the eggs, the larvæ and the pupæ. On the other hand, if the vegetation is too dense it precludes the possibility of the larvæ gaining access to the surface (and most of them must do this, as had been said) and so literally drowns them; *Spirogyra*, the green scum found so commonly in stagnant water of a more permanent character, acts in much the same manner as the ordinary surface vegetation, but in addition to shutting off the air supply frequently entangles the larvæ and drowns them before they reach a point even near the surface. In the larger woodland pools where water beetles are abundant the larvæ naturally keep to the edges and cautiously move along the bottom under the protection of the sunken leaves.

Temperature likewise has considerable effect on the larvæ and pupæ, but scarcely as to influence choice of environment. In early spring these stages may together extend over a period of six weeks, while in midsummer the same species may pass from egg to adult in ten days. On the other hand a low temperature seems to have little effect on the hatching of the eggs. Some of the spring species may emerge from the egg in February, and an egg boat of *pipiens* will produce young as quickly when placed in spring water as when placed in rain water. Agitation seems to be of greater consequence than temperature in the hatching of the eggs. A rainstorm therefore will often hasten the eggs to hatch.

As to the distribution of mosquitoes all the species appear to be found wherever their respective environments occur. Thus while such species as *Culex abfitchii, canadensis, musica* and *pretans* are common in the wooded districts of the north of New Jersey they are also found in these same districts in the south of this state—in lesser

numbers only because wooded districts are there here in number and of less extent. *Culex atropalpus* which breeds in rock pools is found in Massachusetts and Connecticut and again along the Potomac River in Maryland. New Jersey is apparently passed by because she has no suitable rock pools to offer, her shores being made up of sands and marshes. *Wyeomyia smithii* is found in the leaves of the pitcher plant wherever this plant occurs, be it in the cedar swamps of southern New Jersey or the bogs of Warren Co. in the north of the state. *Culex triseriatus* and *signifer* likewise are found wherever tree cavities contain water for a considerable time. *Culex dyari,* it is true, while it may not be rare in the mountains in the northwest corner of the state will probably not be found in the lowlands in the south of the state; it seems to be a mountain species, and perhaps the exact conditions for it are not to be found except in the mountains. *Culex melanurus,* also, has so far been found only in the cold spring-fed bogs of South Jersey. *Culex perturbans,* on the other hand, is common in all portions of the state, low and high, where permanent swamps thickly overgrown with vegetation occur, and similarly *Culex aurifer* occurs in the more permanent woodland water areas along the cranberry bogs of the south and along the edge of Lake Hopatcong and other large ponds and lakes in the north. *Anopheles crucians* of the salt marsh is seemingly a more southern species, being always present in Cape May, less so in the vicinity of Barnegat Bay and positively rare around Perth Amboy and Elizabeth. *Culex tæniorhynchus* likewise has a tendency in this direction, being apparently a more southern species; yet occasionally it is met with in large swarms on the meadows of Long Island Sound.

Only two species known to me are given to breed in two distinct environments. These are *Culex sylvestris* and *Ædes fuscus.* The first of these is typically an open swamp species, but in the spring of the year is found in comparatively small numbers in typical woodland pools. The individuals from these woodland districts are smaller and darker than those produced later from the open swamps. The second is essentially a woodland species, but is occasionally found in numbers in open swamps, the converse of *sylvestris.* In this instance no differences are manifest between the adults produced in the different environments.

GALL MIDGES IN AN AQUATIC OR SEMIAQUATIC ENVIRONMENT.

By E. P. Felt,

Albany, N. Y.

It is difficult to draw a sharp line in the case of the gall midges, at least between those occurring under what might be termed an aquatic environment and those inhabiting a moist terrestrial environment. At the outset we would call attention to the following list of European gall midges occurring in what is probably an aquatic environment.[1]

Perrisia inclusa Frfld., in sedge stalks.

Thurauia aquatica Rübs. in *Carex*.

Thurauia uliginosa Rübs. in *Carex*.

Lasioptera arundinis Schin. in reed stems.

Lasioptera flexuosa Winn. in reed stems.

There are in addition to the above, a number of other European species which have been reared from *Carex* and other water-loving plants. These, in case any one be specially interested, are listed in Les Zoocécidies des Plantes d'Europe et du Bassin de la Mediterranée, Vols. 1 and 2, by Dr. C. Houard.

Comparatively few American species have been reared from aquatic or semiaquatic plants. The European records for the Cyperaceæ include four genera and nine species, while in this country only two genera and two species have been reported from members of this family. There is good reason for believing that a number of species of *Hormomyia* live at the expense of plants belonging to this natural order. Here is an excellent field for one wishing to undertake profitable biological work. The following is a list of American species reared from aquatic or semiaquatic plants.

Rhabdophaga cephalanthi Felt, reared from twig galls on buttonbush, *Cephalanthus*.

Cecidomyiid larvæ have been recorded from the leaves of waterhemlock, *Cicuta*.

Thecodiplosis dulichii Felt was reared from the fruit of *Dulichium*.

[1] 1910, Die Süsswasserfauna Deutschlands Heft 2 *a*, Diptera, by K. Grünberg, pp. 16–20.

Neolasioptera hibisci Felt inhabits the swollen stems of the swamp rose mallow, *Hibiscus moscheutos*.

Itonida taxodii Felt produces a conical, globular or elongate deformation of the leaf of the bald cypress, *Taxodium*.

Thecodiplosis ananassi Riley causes a fusiform twig gall on the bald cypress, *Taxodium*.

Many willows occur in aquatic or semiaquatic environment. A list of the numerous galls occurring upon the different willows is given in Economic Entomology, Journal, 4: 468–69. There are doubtless in this list, extending from pages 451 to 475, a few other species which have been reared from plants normally growing in an aquatic or semiaquatic environment.

TABANIDÆ AS INHABITANTS OF THE HYDROPHYTIC AREA.

By Raymond C. Osburn,

New York, N. Y.

All Tabanidæ undergo the larval stage in water and so belong at this time to the hydrophyte fauna, no matter how far afield the adults may roam in search of food. As the males do not attack animals they usually do not wander far and must usually be collected by sweeping the grass at the edges of the streams and swamps where the females naturally return to lay their eggs after feeding. The eggs are usually laid on the stems of grasses over the water and after hatching the young fall into the water. The writer has observed the female of *Chrysops flavidus* "dipping" over the water and occasionally touching it with the tip of the abdomen after the manner of many dragonflies, but whether eggs were being deposited in the water during this performance is not known. If so it is the only case known in this group where the eggs are deposited in the water.

The exact relations of the larvæ of Tabanidæ to special kinds of aquatic surroundings have not been carefully studied, but some notes and personal observations are at hand which indicate that some variation exists in this matter. A fairly satisfactory clue to the larval habitat is found in the occurrence of the males, which in ordinary cir-

cumstances never wander very far from the breeding places. Careful inspection may often reveal the egg-masses also. Such observations, though recorded only infrequently, show that certain species, especially of *Chrysops* (the deerflies) more often frequent the spring-fed brooks and small streams, though species of *Tabanus* (horseflies) may also breed in similar situations. Some species of *Tabanus* appear to breed mostly in small upland marshes, while others seem to be confined to the marshes about lakes. *Chrysops brunneus* and *C. flavidus* frequent the larger marshes. A few species occur in brackish waters. Thus *Tabanus costalis* is a common inhabitant of slightly saline inlets and seashore marshes, and *Chrysops flavidus* has much the same habitat, though both may frequently breed in perfectly fresh water.

A prolongation of the terminal portion of the body bearing the stigmata permits these breathing organs to be raised to the surface of the water in respiration. This tube is composed of joints which telescope into each other when the tube is withdrawn. Naturally such an adaptation is related only to a shallow water existence, since the breathing tube can be protruded to only a limited extent. As a matter of fact the larvæ are sometimes found in moist earth where there is no standing water.

In this region the following species have been taken and must be reckoned as a part of our hydrophilous fauna:

Chrysops niger Macq. . . . . Lakehurst, N. J.
flavidus Wied. . . . . Lakehurst and Ramsay, N. J.
callidus O. Sacken. . . . . Ft. Lee, N. J., and Van Cortlandt Park, N. Y.
univittatus Macq. . . . . Ft. Lee, N. J., and Lakehurst, N. J.
vittatus Wied. . . . . Ft. Lee.
excitans Walk. . . . . Lakehurst, N. J.
celer O. Sacken. . . . . Van Cortlandt Park, N. Y.
carbonarius Walk. . . . . Ft. Lee and Newark, N. J.
mœchus O. Sacken. . . . . Ft. Lee, N. J.
obsoletus Wied. . . . . Ft. Lee and Van Cortlandt Park, N. Y.
cuclux Whitney. . . . . Orange Mountains.
plangens Wied. . . . . Passaic, Newark Meadows and Staten I.

lugens var. *morosus* O. Sacken..	Lakehurst, N. J.
parvulus Daecke.............	Lakehurst, N. J.
hinei Daecke.................	Lakehurst, N. J.
delicatulus O. Sacken.........	Lakehurst, N. J.
sackeni Hine.................	Ft. Lee and Paterson.
cursim Whitney..............	Lakehurst, N. J.
brunneus Hine...............	Newark Meadows.
fulvostigma Hine.............	Lakehurst, N. J.
Tabanus cinctus Fabricius.......	Lakehurst, N. J.
lasiophthalamus Macq.........	Ft. Lee.
trispilus Wied................	Ft. Lee and Van Cortlandt Park, N. Y.
pumilis Macq................	Ft. Lee and Lakehurst, N. J.
lineola Fabr..................	Paterson.
nigrovittatus Macq...........	Ft. Lee and Sandy Hook.
costalis Wied................	Ft. Lee and Van Cortlandt Park, N. Y.
atratus Forst.................	Ft. Lee and Van Cortlandt Park and L. I.
americanus Forst.............	Ft. Lee and Palisades.
bicolor Wied.................	Ft. Lee and Orange Mountains.
zonalis Kirby...............	Greenwood Lake, N. J.
exul O. Sacken...............	Orange Mts. and Newark.
molestus Say.................	Orange Mountains.
orion O. Sacken............	Palisades.
giganteus DeGeer............	Palisades and Ft. Lee, N. J.

Any others that may be added to this list of Tabanidæ will, because of the aquatic nature of the larval stage, necessarily fall in the list of local insects inhabiting the hydrophytic area.

SYRPHIDÆ IN THE HYDROPHYTIC AREA.

BY RAYMOND C. OSBURN,

NEW YORK, N. Y.

Very few of the Syrphidæ actually live in the water at any time of the life cycle, though certain of the Eristalinæ, which have "rat-tailed" larvæ, inhabit muddy pools and saturated filth during the larval stage. It is true that many species may be found about flowers in swamps, but often these are merely strong fliers that have found their way there for the sake of visiting the flowers and have no relation to the hydrophytic environment otherwise. They must be classed as stragglers. A few species have been reared from larvæ taken in the flowing sap of trees and the larvæ of *Chilosia alaskensis* Hunter and *C. hoodiana* Bigot live in the resinous sap of coniferous trees just beneath the bark where they produce the timber blemish known as "black check."

The adults of certain species habitually frequent the marsh grasses at the edge of streams and in swamps, and may be considered a part of the regular fauna of such situations. Such are *Platychirus quadratus* Say, *P. hyperboreus* Staeg., and *P. chætopodus* Williston. These species are not very strong fliers, as Syrphids go, and are seldom found far from swampy regions. Their breeding habits and those of the larvæ are unknown. All of them have been taken at Ft. Lee, N. J., and at Van Cortlandt Park, New York.

Of the species which breed in wet filth may be mentioned *Eristalis tenax* Linne, *E. bastardi* Macquart and *E. æneus* Fabricius, all of which belong to the fauna of the hydrophytic region, even though the adults may wander long distances from the water in visiting flowers. These species may frequently be taken around New York City, about their breeding places. The writer has observed tenerals of *E. meigenii* emerging from a pile of saturated horse manure.

Helophilus lætus Loew and *H. hamatus* Loew are usually found only about marsh flowers or close to marshy places. Although their larval habits are unknown the constantly limited distribution of the adults about swamps and pools seems to indicate that they belong to the hydrophytic area. *Tropidia quadrata* Say is also found pretty constantly about marsh grasses and at the edges of wet areas.

Criorhina verbosa Walker is usually taken in early spring about willow bloom, but whether it has any other relation to the swamp, or whether it emerges at a time when it is compelled to seek the willows as the only available source of food is questionable.

It appears that the few Syrphidæ larvæ which have an aquatic habitat do not frequent clear streams or pools but always stagnant waters that contain a large amount of organic matter. The special adaptation of the larva by which they are able to maintain respiration while submerged, lies in the elongation of the terminal appendage containing the posterior stigmata. This organ can be elongated so as to reach the surface in shallow water and can be withdrawn. This applies also to species living in sap and resin.

THREE NEW CICINDELIDS.

BY EDW. DOUBLEDAY HARRIS,

NEW YORK CITY.

Cicindela Smythi new species (fig. 1).

Head and thorax green with coppery reflections; elytral ground dull coppery, densely punctate green; markings entire and all very broad, marginal band merged with both lunules and one third of the elytral width; humeral lunule a trifle more than one third the elytral length, crescent shaped, recurved at extremities; middle band sharply reflected near suture, and terminating with hook; apical lunule at apex continued forward on sutural line.

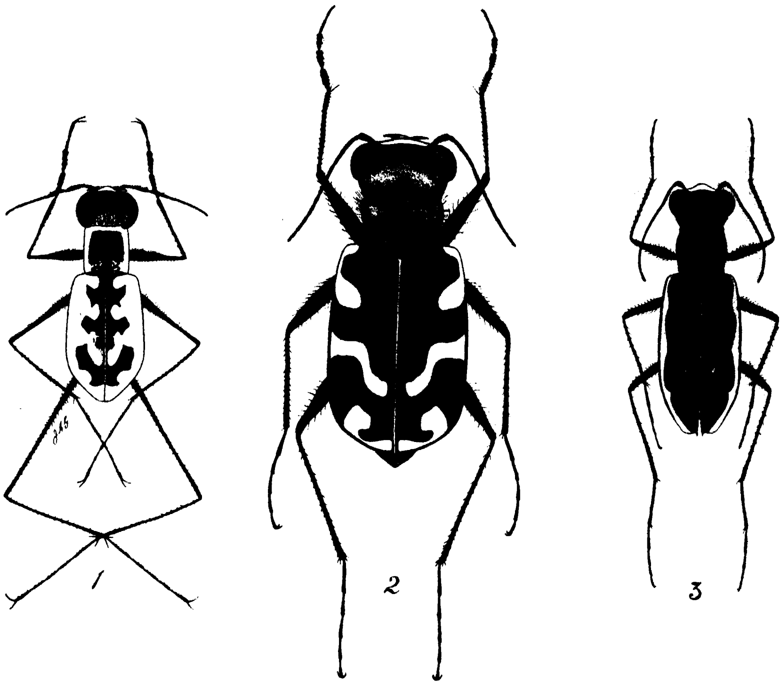
Eyes large, prominent and converging in front; front finely rugose, a single seta above the eye; thorax densely punctate; beneath green, shiny, naked except at sides; basal joints of antenna, femur and tibia of the front and middle leg, sides of thorax and body clothed with white hairs; legs green, shiny, very long—the femur of hind leg being as long as combined thorax and elytra, and the combined femur, tibia and tarsus being more than twice the length.

Not as parallel in outline as *chlorocephala,* more metallic, elytra more rugose, maculation much broader, the lunules and marginal band confluent, not separated, much more pilose. Length 8–9 mm.; length hind legs 15 mm.

Taken by Eugene G. Smyth at the ocean side of Padre Island, Texas, in June, running on the sand with *Saulcyi* and *media,* not plentiful, very swift on foot.

Allied to *C. chlorocephala* Chevr., and possibly a variety of this

species, though with certain racial features that may entitle it to specific value.



Cicindela Lantzi new species (fig. 2).

Above dull greenish, with coppery reflections quite pronounced on front and thorax; markings consist of lunules complete, and middle band; the humeral lunule is emphasized posteriorly, not recurved; middle band proceeds from margin transversely one half the elytral width, thence obliquely descending and gently turning at the extremity towards the suture. The markings resemble those of *C. echo,* and also of *pseudosenilis,* but the humeral lunule is less arcuate and the middle band more sinuous than in either.

Head finely granulose at base, the front moderately rugose; labrum white, short, and furnished with three teeth, the middle one slightly the larger. Thorax convex, slightly broader anteriorly, moderately granulose, hairy at sides. Elytra widest at posterior third, rather flattened, humeral angles distinct, surface smooth, slightly and evenly punctate without foveolæ.

Beneath green, sides of thorax and prosternum brilliant coppery, and slightly pilose. Length 11 mm.

Taken by D. E. Lantz on a newly worked road at the side of a gravel hill in Jefferson, Col., in July, in company with *C. laurentii* and *C. graminea.*

Its resemblance to several of the alkaline lake forms in its markings renders it a peculiarly interesting species, but it is readily separated from them by its distinctly toothed labrum, the smoother and less shining elytral surface, and the slight but significant differences in the maculation.

Cicindela debilis var. segnis new var. (fig. 3).

Head, thorax and elytral ground dark green; beneath green, shiny; maculation a continuous whitish band the entire elytral length slightly removed from the margin except near the apex, the positions of the lunules and middle band indicated by slight widenings of the marginal band; frequently the middle band is existent as a narrow, faint oblique line, nearly straight, somewhat broadened at sutural termination.

Eyes large, front finely rugose, thorax narrow, as wide as long, nearly cylindrical, slightly pilose at sides, humeral angles square, elytra shagreened, in form regularly ovate, separated posteriorly along the sutural line nearly one third the length, rounded at apex, and at sutural angle terminated with short black spine, which is more pronounced in the male. Length 9–10 mm.

Taken running on sand at Sonoita, Ariz., by Eugene G. Smyth in July.

A varietal name seems to be warranted for a form so widely removed geographically from the type locality (Durango, Mexico), by the difference in the elytral sculpture, in its larger size, and in its color. Bates described *debilis* as "*fusco-nigra, raro viridis, subtus nigra vel cyanea.*" All the Arizona specimens secured by Smyth were green.

FREDERICK BLANCHARD.

In the death of Frederick Blanchard on November 2, 1912, the students of North American beetles have lost a faithful aid and correspondent, and many of us a dear friend.

Frederick Blanchard, the son of Cornelius and Sarah (Sherburne) Blanchard, was born August 20, 1843, at Lowell, Mass., and lived there and at Tyngsboro, all his life. His business life was spent in the First National Bank of Lowell, and in the Prescott National Bank

of Lowell of which he was cashier, until, in 1896, he retired from active business.

In 1874 he married Miss M. Louise Dow, who survives him. They had no children of their own, but they loved children and adopted a son George, who was drowned at the age of twenty-four, in March, 1904. This was the first of a series of misfortunes which came to them in recent years, yet they bore all their afflictions with quiet fortitude, sustained by the perfect understanding and love between them.

A few years before his retirement from the banking business, they built a very comfortable home at Tyngsboro, on the Merrimac River, a few miles north of Lowell. A fine grove of pine trees completely shut off the Nashua road from view, and here surrounded by the woods and fields, and his large garden, he lived the last twenty years of his life.

Mr. Blanchard was a Coleopterist of the old school, not a specialist, but thoroughly familiar with all families of the order, and with all the literature. His collection of local species was very complete, most carefully and neatly mounted and labeled, thoroughly studied and correctly determined by himself.

He travelled little, but when away used diligently every opportunity for collecting beetles, and his local collection was finely supplemented by extensive series from the White Mountains of his own collecting, and from Highlands, Macon Co., N. C., where, at an elevation of 3,800 feet, he and his brother spent several summers. Of recent years he used to visit the Appalachian Camp on Three Mile Island in Lake Winnepesaukee, N. H., with Mr. Emerton, and there, as everywhere, he did remarkably thorough collecting.

He did not publish a great deal, though some of his observations appeared from time to time in the various entomological journals. In 1885 he presented (Trans. Amer. Ent. Soc., Vol. XII) a table of the species of *Canthon* and *Phanæus,* and in 1889 (Trans. Amer. Ent. Soc., Vol. XVI) a revision of the genus *Cardiophorus,* of which he described twelve new species.

But his great knowledge of our North American Coleoptera was ever at the disposal of his many friends and correspondents, old and young. No man ever wrote a more charming letter. There was no constraint, no attempt at abbreviation, but instead, always an easy and conversational style. His letters were neatly and closely written,

full of the most valuable information, discoveries, observations, notes and suggestions. Often there was no room for the signature except at the edges, and these, too, frequently carried postscripts. Needless to say, a letter from him was always a treat and an inspiration.

But while one learned to cherish the man merely from reading his letters, we learned to love him as a friend after meeting him and partaking of the ever-ready hospitality of the Blanchard home in Tyngsboro. The simplicity and kindliness of the man and his wife appealed to all, and though the first visit was eagerly anticipated, the subsequent ones were even more so. His collection, his fine library, were exhibited and explained with a quiet unobtrusiveness which was delightful, and he personally conducted his guests to the local haunts of their favorite beetles or other insects, and assisted in their search and capture. Indeed he interested himself in all the activities and studies of his many friends, vieing with them in their enthusiasm, and extending every possible assistance that he could think of.

To many less conveniently located he was the willing and accurate interpreter of the Le Conte types at the Museum of Comparative Zoölogy in Cambridge, of which he was a constant visitor. He knew the Le Conte collection as an open book and loved it as if it were his very own. In 1911 his name was enrolled in the Harvard University Catalogue as associate in entomology of the University Museum, a well-deserved honor, which was a distinction to the Museum as well.

JOHN D. SHERMAN, JR.

A CORRECTION.

On page 272 of vol. XX the remarks under *Collops 4-maculatus* should be cancelled and the following substituted:

C. 4-maculatus Fab. Ent. Syst. Suppl., 70.

This common eastern species is too well known to need description in detail, and the tabular characters will probably suffice for its recognition in all cases. I have never seen a specimen with the elytral spots connected or with any indication of a thoracic spot. The basal joint of the antennæ in the ♂ is moderately thick, ovate triangular, scarcely flattened, not more than ½ longer than wide; the second

joint is plainly longer than wide when viewed on the lower convex face, the claw-like appendage short. The species is widely distributed, the following localities being represented in the material studied. Massachusetts; Rhode Island; New Jersey; Indiana; Illinois; Kentucky; Kansas; Arkansas; Texas.

PROCEEDINGS OF THE NEW YORK ENTOMOLOGICAL SOCIETY.

MEETING OF OCTOBER 1, 1912.

A regular meeting of the New York Entomological Society was held October 1, 1912, in the American Museum of Natural History, at 8.15 P. M., President Dr. Raymond C. Osburn in the chair and seventeen members present.

Mr. Sherman spoke of his visit to the White Mountains in September, and said that below the tree line the collecting was the poorest he had ever experienced, due probably to the cold, wet summer. Above the tree line, however, the pools among the rocks yielded as many water beetles as in former years, and judging from one day spent on the summit, the number of Carabidæ under stones was as great as ever. Captures of special interest were *Scutopterus angustus*, found in Star Lake above the tree line, previously known from Hermit Lake below the tree line, *Hydroporus oblongus*, also found in Star Lake and previously known from Winnipeg, and *Patrobus rugicollis*, a species peculiar to the White Mountains, found under stones along both branches of Peabody River. Mr. Sherman spoke of the increasing number of visitors to the White Mountain camps and the greater facilities afforded by the new camp in the Great Gulf, 3,100 feet above sea level, and the addition to the Madison Hut, which now consists of two buildings, one used for cooking while the other is reserved for sleeping. Mr. Sherman recommended the Glen House as headquarters for entomological work in the White Mountains, on account of the numerous trails, which, including the new Davis and the Six Husbands' trail, make many different parts of the mountains accessible.

Mr. Engelhardt spoke of his six weeks' experiences in Newfoundland and Labrador, part of the time in company with Mr. Leng. Four principal stations were visited in Newfoundland, namely Port aux Basques, Bay St. George and Bay of Islands on the west coast, and Spruce Brook about fifty miles inland. At the first, Port aux Basques, where the first view of Newfoundland from the steamer *Bruce* shows granitic mountains a thousand feet high, very barren and with large patches of snow in July, no satisfactory hotel was found. A mile and a half north on the railroad a stopping place was found at Channel, a small fishing village, situated amid extremely boreal conditions, where pools among the rocks yielded species akin to those of Labrador. The Cape Ray Mountains in the immediate vicinity make a natural barrier against fog and

cold wind, and ten miles beyond them at Cape Ray lighthouse much milder conditions were found, with tiger beetles, Orthoptera and forests of spruce and birch on the mountainside.

At the second station, Bay St. George, very comfortable quarters were found in Martin's Log Cabin Hotel, at Stephenville Crossing, with a greater variety of environment and better collecting than at any other place visited on the west coast. The bay is surrounded by extensive sandy areas, in which three species of tiger beetles were found. The limestone Table Mountain is accessible with *Cychrus nitidicollis* living on its sides and *Trechus* and *Bembidium* in the leafy mold accumulated in the cold pits of its gypsum cliffs. A little northward on the railroad rich forests and sphagnum bogs are encountered. The nights were too cool for good results at sugar and light, although beetles were attracted by bottles with sugar mixture, including the rare *Miscodera arctica*. The diurnal Lepidoptera, however, included many northern forms of interest, like *Papilio turnus* in its northern form, *Papilio asterias* variety *brevicauda, Lycæna pseudargiolus,* northern form, *Lycæna scudderi, Chionobas,* etc., attracted with hosts of Diptera and Hymenoptera to the numerous wild flowers.

At the third station, Bay of Islands, comfortable quarters were found at Fisher's Hotel, Humbermouth, and the same northern species were found, but on account of the absence of sand, perhaps, no tiger beetles. Night work was tried again here, but it was too cold and rainy for good results. The methods most productive were turning stones, logs, etc., and sifting. One field was found not closely cropped by sheep, and there the sweeping was excellent.

The fourth station was not visited until the return from Labrador, when a week in the middle of August was spent at the Log Cabin Hotel at Spruce Brook on George's Pond. It was too late for diurnals, which in fact were often found faded and torn while at Stephenville, between July 10 and 15, but the night collecting at sugar and light seemed excellent, and 75 to 100 specimens were caught nightly. This locality was more inland, about fifty miles from the coast and protected by ranges about 1,500 feet in height. Along the railroad track for miles, wild flowers were plentiful and yielded many insects; thickets of alder, forests of spruce and birch, a sphagnum bog at the end of the pond and the shores of the pond itself all afforded good and varied collecting, while a path cut through the woods made an ideal spot for sugaring.

In addition to these four stations, at each of which several days were spent, short stops were made, as the Labrador steamer made calls at Port Saunders and at Port aux Choix, near the northern end of Newfoundland, and by sweeping the flowers of the cow parsnip and examining the contents of the net later, considerable numbers of Diptera were obtained.

Continuing, Mr. Engelhardt described the trip from Newfoundland to Labrador and the eight days spent in the latter country, housed with Mr. John Croucher, at Battle Harbor. Temperature ranged between 40 and 50 degrees. One afternoon was fairly clear, but it was foggy or rainy all the rest of the time. During the one clear afternoon, the little blue butterfly was fairly common, and a *Chionobas* and some Geometers were taken. Otherwise collecting was

confined to grubbing and water net. Beetles were found under stones, boards, and especially by sifting the old leaves of willow and birch, which, growing only recumbent against the rocks, sheltered small masses of dry leaves among and beneath their branches. Many species of Carabidæ, Staphylinidæ and a few representatives of other families, Elateridæ, for instance, were thus found, occasionally Geometridæ and Diptera were found in crevices of the rocks and other shelters. Battle Harbor is on an island with hardly any bushes and no trees, but many flowers, 50 or 60 species having been gathered during the week; the soil is constantly wet from the failure of the short summer to entirely thaw the ground, and there are many ponds. The snow, which in Newfoundland lay on the mountain sides in July, here extended to sea level, exerting a retarding influence on the vegetation. Willows in winter state were found beneath the snow, while ten feet from the edge of the snow bank the same were in bloom and twenty-five feet away gone to seed. Carabidæ were found abundantly under stones close to the snow.

In conclusion, Mr. Engelhardt said this northern region fulfilled his expectations, and by the use of native woolen socks and native footwear he had kept in good health despite much exposure to cold, fog, rain and soaking bogs. At Bay St. George especially the personal comfort was great, as well as the collecting excellent.

Dr. Felt, under the general title of experiences during 1912, mentioned the receipt of galls of *Neuroterus saltitorius* Hy. Edw. from Michigan, and the perceptible crepitation produced by the active larvæ; the finding of six puparia, probably *Biomyia georgiæ* B. & B., under the wing covers of *Calosoma calidum* Fabr., and the extraordinary abundance of larvæ and adults of the two-spotted lady beetle, *Adalia bipunctata* Linn. He spoke briefly of collecting *Platypus punctulatus* Chap., kindly identified by Dr. Hopkins, from mahogany logs in Long Island City and the attack by this insect on freshly sawn sappy mahogany boards. This beetle, it was estimated at that time, caused a loss of $200 per day. The occurrence of six specimens of *Seius*, a fair-sized mite, on *Helobia punctipennis* Meign. was noticed. Recent work in rearing *Phormia regina* Meign. and *Sarcophaga georgina* Weid. resulted in determining the period occupied by the various larval instars and showed that the maggots, especially the older ones, were negatively heliotropic. Specimens received during the year enabled him to identify adults of *Uleelia* Rubs. previously known only in the larva. A full discussion of this genus is given in Entomological News, 23: 353–54, 1912. *Itonida inopis* O. S. was reared from swollen scrub pine twigs and its specific distinctness established (Econ. Ent. Journ., 1912, 5: 368–69). Similarly, *Cecidomyia aceris* Shimer was reared by J. S. Houser in Ohio and proved to be a species of *Rhabdophaga*.

Mr. Davis spoke of the many places on Long Island he had visited during the summer, and showed by photographs the abundance of the red admiral butterfly and the capture of one by a spider.

Mr. Davis also spoke of the pink forms of katydids (*Amblycorypha oblongifolia*) and methods of preserving the color, and said that five specimens had been found during the past summer, including one male.

Mr. Engelhardt also exhibited a pink specimen of the same species, also a male, collected in the salt marshes near Woodhaven, L. I.

Mr. Grossbeck said that apparently the pink forms of katydid were unusually abundant this year, and placed on record three more, namely, one *Amblycorypha rotundifolia,* female, collected at Cedar Grove, Essex County, N. J., August 27, 1912, by Bolton, a telephone report received at the Museum of another, and a report of a third from Mr. Joseph Mattes.

Mr. Sleight showed his plan for keeping convenient reference copies of descriptions.

Dr. Osburn announced the programme for the next meeting and requested members to write at least the scientific names of species cited verbally during the meetings to facilitate accuracy of minutes.

MEETING OF OCTOBER 15, 1912.

A regular meeting of the New York Entomological Society was held October 15, 1912, in the American Museum of Natural History, at 8.15 P. M., President Dr. Raymond C. Osburn in the chair and seventeen members present.

The President opened the symposium on insects of Aquatic Environment.

Dr. Lutz read the introductory paper, which is not spread upon the minutes, as it, as well as the papers that follow, will be printed in full in the JOURNAL.

Mr. Sleight read a paper on Trichoptera, showing the species referred to in two boxes, one exhibiting the different stages for each species, the other arranged to show graphically the relation between the speed of the current, the character of the case made by the larvæ and the abundance of each species.

Mr. Barber read a paper on Water Hemiptera, in which the modifications of structure and habits of the species were reviewed.

Mr. Barber also mentioned the occurrence of bed bugs in hens' nests in large numbers and stated that, though this has been known to occur before, it was unusual.

Mr. Grossbeck read a paper on mosquitoes, with special reference to environment, in which he not only gave minute details for each species, but also traced the reasons for their individual behavior in oviposition.

Dr. Osburn read a paper on two groups of Diptera, aquatic to some extent in the larval stage, the Tabanidæ and the Syrphidæ.

At the conclusion of Dr. Osburn's remarks the vice-president, Mr. Chas. L. Pollard, assumed the chair as Dr. Osburn was obliged to leave the meeting to keep another engagement.

Mr. Leng read a paper on "Aquatic Coleoptera," in which he referred to the modifications of adults and larvæ and the special environments under which the species live.

Mr. Davis exhibited his collection of aquatic plants, including those that had been mentioned by previous speakers.

Mr. Sherman read a paper on "Aquatic Dytiscidæ," in which the results of his extensive experience in collecting water beetles was summarized, and a

division of their habitats into meadow ponds, woodland ponds, brooks and springs was proposed and illustrated by series of specimens peculiar to each environment.

Mr. Shoemaker exhibited his large collection of water beetles.

Dr. Felt communicated two summaries relating to gall midges and mosquitoes.

Mr. Dow spoke of collecting Corixidæ in the island of Jamaica, where no natural body of water suitable to their development is found, but where nevertheless vast numbers occur and must presumably have adapted themselves to other than their natural environment.

On account of the late hour, the chairman announced that discussion of the papers that had been read would be postponed till the following meeting.

MEETING OF NOVEMBER 5, 1912.

A regular meeting of the New York Entomological Society was held November 5, 1912, in the American Museum of Natural History, at 8.15 P. M., President Dr. Raymond C. Osburn in the chair and eleven members present.

The curator announced that work on the local collection of Rhynchophora would commence on Saturday afternoon, November 9; also that current numbers of all entomological journals, by arrangement with the librarian of the American Museum, would be found on file in the meeting room.

Mr. Maximilian C. Marshall, of No. 3035 Ocean Ave., Sheepshead Bay, L. I., was nominated for active membership. On motion the by-laws were suspended and Mr. Marshall was immediately elected. Dr. Osburn donated a duplicate paper from his library to the library of the Society.

Under the title "Notes on Collecting in the Northwestern States and in the Canadian Rockies," Dr. Osburn described the journey he had made, starting at the end of May from Minneapolis through North Dakota, Montana and Yellowstone Park, to Tacoma, Seattle and Vancouver, returning via Canadian Pacific Railway, with stops at Revelstoke, Kaslo, Kootenay, Glacier, Field and Laggan, illustrating his remarks by photographs thrown on the screen by radiopticon. Dr. Osburn's visit to the Red River of the North, thirty miles north of Fargo, Dak., was particularly for the capture of *Gomphus cornutus,* and his success will be mentioned in the JOURNAL. In the Yellowstone Park, insects encrusted with lime were found in the hot springs, and will also be mentioned in the JOURNAL. At Kaslo, Dr. Osburn met Mr. Cockle and collected the first day with him on the bluff above Kootenay Lake, and on the succeeding day up stream and partly along line of old railroad, finding *Æshna interrupta* var. *interna* and a species of *Cuterebra.* At Glacier splendid collecting was found on the slopes of Eagle Peak and in a damp mountain meadow where, on July 15, Syrphids were very abundant. The season was rather too early for dragonflies, which would have been more abundant later and up to the middle of August. From Field a side trip was made to Emerald Lake; on the road through a forest of lodge pole pines *Tabanus osburni* Hine, a most pestiferous horse fly, not hesitating to attack humans as well as horses, was very abundant. From Emerald Lake

the Yoho Valley was reached through Yoho Pass and the camp maintained by the Canadian Pacific Railroad near Takaka Falls was visited. Here Syrphids were found in large numbers in the tents, probably attracted by their white walls and torpid from the chilly night air of 4,800 feet elevation and surrounding snow and glaciers. From Laggan Dr. Osburn went to Lake Louise, which he described as the most soul-satisfying spot in the world; there excellent collecting was found on the edge of the lake and in the trails through the woods, where the thick vegetation was often knee deep and even above the head in many places. Notwithstanding the distractions of the scenery, glaciers, snow-clad mountains, lakes and waterfalls, 1,000 Syrphids and 1,500–2,000 insects of other orders were taken on the journey, which will be referred to in greater detail at subsequent meetings.

Mr. Davis exhibited and discussed "A New Cicada from Northeastern America," the description of which will appear in the Bulletin of the Brooklyn Entomological Society, New Series. He also spoke of other species of Cicada, particularly *Cicada pruinosa,* which he said was abundant in a piece of woods near Cape May, N. J., in 1910, but very scarce at the same place and season in 1912, leading to the conclusion that it, like the 17-year locust, takes a number of years for larval growth and consequently appears in broods at regular intervals, the length of which might easily be ascertained by systematic collecting over a term of years in the woods in question. Other interesting species exhibited were *Cicada sayi* var. *australis* from Georgia, a series collected in part by J. Chester Bradley; *Cicada engelhardti,* perhaps a variety *of C. lyricen,* once supposed to have been confined to the Cumberland region, but recently found near Greenport, L. I.; and the following four from Florida, viz., *Cicada pallida,* found in April in the meager pine woods in the interior of Marco Key; *Cicada hieroglyphica,* occurring at Lakeland March 28 and May 5, 6 and 7 and extending thence north to Lakehurst, N. J., where it appears in June; *Cicada parvula,* found in low vegetation only two or three feet from the ground, occurring north to North Carolina, where Manee says it emerges from the pupal skin in the ground; and *Cicada sayi,* found at Labelle. Mr. Davis said this species did not differ from New Jersey specimens in characters or in song, by which in fact he recognized it at first, and then climbing the tree in which it rested, detected its position by the excited waving of the abdomen and caught it.

Mr. Wintersteiner spoke on "Experiences in Collecting Hydrophilidæ" and exhibited a remarkable collection of these water beetles. He mentioned the capture of *Ochthebius foveicollis* on *Myriophillum* growing in stagnant water in July; stated that *Berosus aculeatus,* distinguished easily by testaceous abdomen, is not uncommon near New York, and gave minute information respecting the habitat and characters of all the local species, many hertofore imperfectly known. This paper will be printed in full in the JOURNAL.

Dr. Osburn read a paper on Odonata, which he stated would be turned over to the publication committee for insertion in the JOURNAL along with one by Mr. Davis on local species.

This paper was discussed by Dr. Forbes and Mr. Davis, particularly in

respect of the bearing of the percentage of salt in the water. Dr. Osburn was satisfied that the relation was physiological and not a matter of food supply. Mr. Davis mentioned frogs as numerous in brackish water in Shinnecock Bay, jumping about in sea lettuce. Mr. Davis also spoke of having noticed a species of *Lestes* laying eggs out of water, depending apparently upon the larvæ falling in when hatched. Dr. Osburn said they were also laid in wet wood.

Mr. Davis spoke of *Hydrophilus triangularis* larvæ nearly full grown in a fountain where water lilies were grown, unable to get out. He had taken several and raised them in damp earth, learning incidentally by personal experience that they are capable of biting.

MEETING OF NOVEMBER 19, 1912.

A regular meeting of the New York Entomological Society was held November 19, 1912, at 8.15 P. M., in the American Museum of Natural History, President Dr. Raymond C. Osburn in the chair and sixteen members and two visitors, Mr. Smith, of Ottawa, and R. E. Snodgrass, present.

Mr. Lewis B. Woodruff, of No. 24 Broad St., New York City, was elected a member of the Society.

The President announced the death of Frederick Blanchard.

Mr. Sherman read an obituary notice which will be printed in the JOURNAL.

The President opened the Symposium on Insects of Moist Terrestrial Environment.

Dr. Lutz read the first paper, defining the environment, and illustrated his meaning by lantern slides. He said that the land through growth and decay of vegetation was continually making inroads upon the water or the water by erosion upon the land, and the scene of the conflict was the environment involved in the evening's discussion. The margins of ponds and streams, swamps, moist meadows, bottoms of deep ravines, any place where it would be difficult to collect without at least damp feet would be included, and it would be possible perhaps to find isolated spots of equivalent humidity even at some distance from distinct bodies of water.

Mr. Grossbeck read a paper on the "Lepidoptera of Moist Terrestrial Environment," pointing out that the selection of the species was rendered more difficult by many being general feeders, and others being at times found upon the upland relatives of the swamp plants on which the species usually fed. The list comprises less than fifty species, out of the total of about two thousand species of Lepidoptera found in this vicinity, but is liable to be ultimately increased, as only about half the species have recorded food plants.

Dr. Forbes, in speaking of the "Lepidoptera of both Moist Terrestrial and Aquatic Environment," said that the first departure from normal terrestrial structures might be traced in the greasy hairs of the salt marsh caterpillar, liable to be floated off flooded lands, and enabled thereby to endure temporary immersion. From this point the development of the aquatic habit may be followed in the Nymphulinæ, through four groups, the first living normally above

water on marsh plants, the second living below water in a case or nest, but breathing air, the third breathing water by tracheal gills and living in still water, the fourth with simple gills in swift-flowing water exemplified by an unnamed species discovered at Ithaca. Dr. Forbes discussed a number of species feeding on strictly marsh plants, including the snout moths, *Scirpophaga* sp., feeding on rushes, *Schœnobius* sp., feeding on roots, *Nonagria* with large end spiracles, *Leucania unipuncta, Ommatostola* and other salt marsh forms. Referring to the Nymphulinæ, he spoke of the fresh leaves of which the cases in which the larva lives below the water are composed, aiding in aërating the water, and the habit of the larva to wriggle every few seconds to change the water. He said that among those with tracheal gills, those that began the life cycle in June would live on the surface of the leaves, and the pupa would be formed there, while the August brood would at first mine the young tender leaves at the root, forming movable cases later, hibernating among the stems and being active as late as November. There is no known fully aquatic imago, but *Nymphula icciusalis* can come up through the water before expanding and apparently must do so. Dr. Forbes exhibited part of the Museum collection, pointing out especially the forms provided with gills and living on *Elodea* and water lilies.

Mr. Barber, speaking of the "Hemiptera of Moist Terrestrial Environment," said the species of Acanthiidæ were found along wet shores, also the toad bugs, *Gelastocoris* sp. Their life history is unknown, but they are assumed to be carnivorous. Of the Pentatomidæ species like *dubius* and *ligata* feed on marsh plants.

Mr. Davis, commenting on Mr. Grossbeck's list, said that *Pamphila panoquin* was often found upon sea lavender, a plant of moist situations on salt marshes, but that he had found the imagos in some numbers in Cape May County, N. J., at least a mile from sea lavender, among golden rod, introducing some doubt as to its being exclusively an insect of moist terrestrial environment. Similarly, while all Saturnidæ are liable to be found in moist situations, witness the great baggy cocoons of *Cecropia* on *Decadon verticillata* (loosestrife), yet they were not so found exclusively, and care should be exercised to avoid drawing false conclusions.

Mr. Grossbeck and Dr. Forbes discussed these remarks; the latter stated that he had found the imago of gill-bearing Nymphulinæ a quarter mile from water and considered such adult flight no contradiction of the known larval habit.

Mr. Davis, continuing, spoke of the Orthoptera of places where wet feet might be expected; he said the grouse locust, *Ophelia pelidina*, was pretty regularly confined to places that were quite wet. Of *Schistocerca* the form *rubiginosa* was confined to dry situations, while the form *alutacea* would be found in quite wet places. *Melanoplus bivittatus* was also more often found in wet places. *Paroxya floridiana* and *atlantica* and *Scudderia texensis* were further instances. In *Conocephalus* the species *exiliscanorus* is emphatically the marsh species, while the other species inhabit upland meadows, sometimes moist but often dry. *Orchelimum pulchellum* and *Gryllotalpa borealis* and the species of

Tridactylus are also more usual in wet places, but exceptionally found in dry. Mr. Davis made it plain in furnishing these instances of Orthoptera more abundant in moist terrestrial environment, that the association was always in his experience more or less incomplete and properly to be expressed as the usual habitat of the insect, rather than as a necessary result from the characteristics of the environment.

Mr. Davis also showed from his collection of plants some of those referred to by previous speakers, particularly those which by the form of the leaves or by sticky hairs catch insects. The pitcher plant, of which one specimen was eaten by an insect, drew from Dr. Forbes an identification of the insect that had caused the damage, a species of *Exyra*, probably *rolandiana*. In the case of the sundews, abundant at Lakehurst, Mr. Davis showed also some of the insects he had found entangled in the hairs.

Mr. Barber invited some discussion of the limits of the topic, especially in respect of insects feeding upon palustral plants. Dr. Lutz and Mr. Leng spoke on this subject, and it was understood that while generally speaking insects infesting plants should be reserved for the symposium of April 15, yet the introduction of such as exhibited special adaptations for aquatic or hydrophytic environment was appropriate in connection with those subjects.

Mr. Leng read a paper on "Coleoptera of Moist Terrestrial Environment," in which he referred especially to the species of Carabidæ frequenting the shores of ponds and streams, showing for instance that the distribution of the genus *Omophron* was controlled by local environment, while the species *tessellatum* was confined to the sea beach and the species *labiatum* to the more austral parts of our region. Numerous other instances were given to illustrate a similar restriction of distribution by moisture. Mr. Leng also referred to the larva of *Brachinus*, said by Wickham and by Dimmock and Knab to be parasitic on the pupa of *Dineutes assimilis*.

Mr. Harris, being asked to speak of tiger beetles, said that *Cicindela hirticollis* was more addicted to wet burrows for its larva than any other species, having been found on Long Island sand bars in situations inevitably wetted at high tide. *C. marginata* also frequents low banks near tidal streams, but as a whole tiger beetles do not come within the scope of the present subject.

Mr. Pollard spoke of *Orchelimum volentum* at Greenfield Pond, near Wilmington, N. C., when disturbed, diving, always beneath the lily pads. Dr. Forbes asked if *Thysanura* were not peculiarly insects of moist terrestrial environment.

Mr. Dow said that they lived in such wet places. Mr. Schaeffer said that they would be found in cellars or among wet leaves. Mr. Dow said they should really be divided into two classes, the bristletails being found in drier places than the springtails, which must have wet environment, as their mouths cannot take in food unless it is rotted to an almost liquid consistency.

The President asked Dr. Forbes if the species found on *Nelumbo* would be the same as those found on water lilies.

Dr. Forbes replied yes, that *Pyrausta penitalis* had habits similar to the

second group of Nymphulinæ, making a pocket in water lily petioles. *Nymphula maculalis* he knew lived on *Brasenia* as well as on water lilies.

The President asked Mr. Davis what *Conocephalus* would probably be abundant in the extensive marshes at Sandusky, O.

Mr. Davis replied probably *exiliscanorus,* for one might catch *caudelianus* and other species dry shod, as they preferred dryish meadows not nearly so wet as those frequented by *exiliscanorus.*

Dr. Forbes, commenting on Mr. Leng's paper, said it was noteworthy that many Lepidoptera were provided with fossorial legs.

Mr. Schaeffer corrected Mr. Leng's statement that there were two local species of *Elaphrus,* since he had personally taken one specimen of a third, *E. cicatricosus,* at Fort Lee.

Dr. Forbes, supplementing his previous remarks, stated that the true Micropterygidæ (*Micropteryx* in Europe and doubtless *Epimartyria* here) feed on moist mosses, where they must be continually wet or partially submerged, the situation being about the same as that of sphagnum. The adult moths are normally found eating pollen of aquatic flowers. He also furnished a list of species infesting the different aquatic plants.

Dr. Osburn said that many Diptera were found in moist terrestrial environment, the larvæ of many Tipulidæ and Tabanidæ living and pupating in mud at the edges of pools, the adults being seen resting often on the water. Many groups of Muscidæ and Syrphidæ also might be included, living in mud and burrowing in rotten wood and fungus.

Dr. Lutz, speaking of the uncertainty as to the precise limits of each environment, said it might be well to state, that xerophytic environment to be discussed on December 17 should include such places as pine barrens of Lakehurst, sand dunes at Rockaway, dry hillsides, and all places too dry to tempt gardening operations. It would be interesting on the assumption that insects abhor absolute dryness, to show how those of the pine barrens, etc., avoid it by burrowing or otherwise. It might prove that such conditions are, however, eminently suited to such an order as Hymenoptera, which have been scarcely cited in the aquatic or hydrophytic discussions. Continuing, Dr. Lutz said that the reason the mesophytic environment stood fourth on the list was that in the evolution of environments, aquatic and moist terrestrial lead to mesophytic by one route, while xerophytic leads to it by another, so that the mesophytic is the climax of the evolution of environments and is appropriately reserved for later consideration. He regretted that in the discussions so far but little attempt had been made to show why a given insect preferred a certain environment and hoped that this phase of the subject might receive further thought.

Dr. Forbes said that in the case of the species of *Leucania* but one was provided with greasy hairs. In the damp conditions of the marshes in which it lives, where presumably the fungus disease, or flacherie, would be especially liable to attack the caterpillars, this species might enjoy a decided advantage on account of the greasy hairs resisting the disease.

Mr. Davis exhibited the walking stick insect, *Diapheromera carolina* Scud-

der, captured by Mrs. Annie Trumbull Slosson at Lake Toxaway, N. C., and said it was easily distinguished from *D. femorata* and *D. veliei* by the form of the male genitalia. The species was described from one male from North Carolina, but was not included in the list of Orthoptera of North Carolina by Sherman and Brimley, Ent. News, November, 1911.

MEETING OF DECEMBER 3, 1912.

A regular meeting of the New York Entomological Society was held December 3, 1912, at 8.15 P. M., in the American Museum of Natural History, President Dr. Raymond C. Osburn in the chair with nineteen members and one visitor present.

The Curator reported continued work on the Geometridæ of the Local Collection, also the results of winter collecting at Ramsey, in company with Messrs. Sleight and Leng, in adding to local records and increasing the series in the Local Collection.

Mr. Engelhardt's remarks on "Lepidoptera from Casco Bay, Me., and the White Mountains, N. H.," were based on observations and insects collected during a two weeks' trip from September 10 to 24 to Portland and Orr's Island, Me., and North Conway, N. H.

At Cape Cottage near Portland, as well as in many of the islands in Casco Bay, deciduous trees and shrubs had suffered from the attacks of the brown-tail moth, *Euproctis chrysorrhea*, to an extent which gave vast stretches of the landscape an appearance of being superficially scorched by fire. Scattered individuals of adult moths and unhatched egg clusters could still be found, but greatest in number were the colonies of young larvæ already housed in their hibernating tents. Several of the adults of this insect attracted to electric lights were also observed by the speaker at North Conway. Quite numerous on Orr's Island feeding on aspen were the larvæ of *Pheosia dimidiata* and *Smerinthus cerysii* and feeding on bayberry, the larvæ of *Samia columbia*. Extremely common in the dense spruce thickets on this island were the geometrid moths, *Tephroclystis interruptofasciata* and *Mesoleuca immanata*, and less common *Hydriomena contracta*. *Catocala relicta* and *concumbens* could not be overlooked on account of their numbers. In the suburbs of Portland five and six specimens at a time were counted resting on a pole or tree trunk near an electric light. At North Conway, which may be called the southern gateway to the White Mountains, a grove of magnificent red and white pines conveniently near the hotel received the most attention in the collecting line. On several nights trees were baited for moths and at other times the beating of branches with dry leaves still attached, a favorite resting place for moths during daylight, was resorted to. Both methods gave satisfactory results.

In its diversified character, this region offers exceptional opportunities to the entomologist and botanist. Stretches of typical pine barren extend up the valley, the foothills are clothed with stately oaks, maples and white pines, and these in turn are succeeded by dense forests of spruce in the higher mountains.

Among others the following species of moths were exhibited at the meeting: *Xylina petulca, signosa, bethunei, fagina, georgi, baileyi, thaxteri, pexata, ferrealis, Anytus capax, privatus, Xanthia flavago, Cosmia paleacea, Dryobota illocata, Euxoa velleripennis, Scopelosoma tristigmata, Nepytia semiclusaria, pellucidaria.* Of the two last named species it was pointed out that *pellucidaria*, originally described by Packard in 1873, but provisionally regarded as a variety of *semiclusaria* in the monograph on this family by the same author, was entitled to specific rank. While both species were found in the same locality, their differences become obvious, even without critical examination upon comparison of the series of about thirty specimens of both sexes taken by the speaker. *Pellucidaria* is a larger insect, wing expanse 1¾ in., color deep dusky, head white; *semiclusaria* ranges smaller, wing expanse 1¼ in., color pale ashy, head yellow.

Aside from Lepidoptera collecting in other orders gave poor results. At North Conway alder thickets had become completely defoliated by the work of *Haltica bimarginata*, but otherwise no beetles were encountered in large numbers.

Mr. Pollard said that the record of *Samia columbia* feeding on bayberry was of great interest.

Mr. Engelhardt said that its usual food plant was larch, but that there was no larch on Orr's Island.

Mr. Leng exhibited three new varieties of *Cicindela* with their related forms, and spoke of their distinguishing characters, pointing out also the interesting fact that their discovery resulted from the distant journeys made by Dr. Osburn, Mr. Engelhardt and Messrs. Davis and Grossbeck during 1912. The descriptions will appear later in the JOURNAL.

Mr. Bird exhibited *Scolytus quadrispinosus*, its larva, pupa, and work in hickory, resulting after emergence in what he termed "shothole effect." He said that two years were required to kill the tree, during which period the larvæ, working around the trunk, destroyed the bast fibers, producing no external sign until the beetles emerged after pupation. The emergence takes place from the end of June to the middle of July, after which the beetles do not immediately mate, but devote themselves to chewing the base of the leaf petioles, making borings in which the mating takes place about the middle of August. The female then lays eggs in little cells, which are discoverable, being confined to the trunk and larger branches, none in branches less than 1½ in. in diameter. The larvæ hatch about the end of August and may be destroyed by squirting gasoline into the holes leading to the egg cells. Mr. Bird added that the usual professional advice to fell infested trees was idle, as the damage was done by the time the shotholes were evident and the beetles were gone to some other tree, usually one of weakened vitality.

Mr. deVyver spoke of the beneficial results obtained in the Bronx by spraying the trees at the egg-laying period with Barkurol or crude carbolic acid, and added that in company with Dr. Felt he had found the beetles attacked by parasites.

Mr. Dickerson spoke of the serious damage caused by this beetle in Nutley and Paterson.

Dr. Lutz spoke of the taxonomy and habits of Muscidæ *sensu strictu,* illustrating his remarks by drawings and Museum collection of these flies. He dwelt upon the characters by which the species are separated, the median stripe, the venation, the color, etc., and pointed out which species are carnivorous and which inhabit dung, intimating that one species of supposedly coprophagous habits probably attacked the earthworms in the manure. He also referred to species attacking flesh before death, burrowing into wounds, nostrils, etc., and to those particularly associated with cadavers.

Mr. Harris referred to his experience in opening old coffins that had been buried one hundred and fifty years in a vault at Cambridge, and finding half a handful of pupa cases of the cadaver fly. He also referred to the paper by Motter in Volume 6 of our JOURNAL on "Insects Occurring in Human Graves."

Mr. Dow, referring to the curator's remarks on winter collecting, said that he was at Bergen Beach on December 1 and found a very rotten and populous oak log, in which a *Dermestes caninus* was found in a burrow. He did not consider this a case of hibernation, for although it had been freezing weather for many days, the temperature in the log must have been fifty degrees or more. He enumerated twenty species of Coleoptera in imago stage and eighteen in larval stage, besides five lepidopterous pupæ, three dipterous larvæ, three hemipterous insects (*Anasa tristis,* the squash bug, being present in vast numbers), pseudo-scorpions, centipedes, sow bugs, slugs and *Thysanura* as indicative of the excessive population referred to.

Mr. Woodruff exhibited the damsel-flies, *Lestes uncata,* taken at Bronxville, July 9, and *Enallagma piscinarium* Williamson, taken at Lakehurst May 29, also *Tetragoneuria spinigera,* taken at Litchfield, Conn., June 29.

In reply to Dr. Osburn he stated that the distribution of *Enallagma piscinarium* is more northerly, extending also to the middle west.

Mr. Davis mentioned two New Jersey records for *Tetragoneuria spinigera,* namely, Greenwood Lake, a specimen taken by Mr. Watson, and Newfoundland, a specimen taken by himself May 28, 1910.

MEETING OF DECEMBER 17, 1912.

A regular meeting of the New York Entomological Society was held December 17, 1912, at 8.15 P. M., in the American Museum of Natural History, President Dr. Raymond C. Osburn in the chair and thirteen members present.

The President opened the Symposium on "Insects of Dry Terrestrial Environment."

Dr. Lutz read a paper on the subject, referring particularly to the sandy areas at Lakehurst, where the loose sand supplied an example of an environment characterized by dryness, heat and ease of penetration for digging insects. He referred to the number of predaceous insects to be found there and to the causes of their abundance; to the number of fossorial insects to be found there; and to the southern aspect of the fauna, which in his view was due to

the environmental effect of the sandy soil. Discussing this phase of the subject further, he said that the higher temperature was itself due to the character of the soil, and that if a sandy road could be constructed from Lakehurst to West Point, ending there in a sandy area of some magnitude, the same southern insects would extend their range that much further north.

The paper was discussed by Mr. Davis, Dr. Forbes and Dr. Felt, especially with reference to the sandy area at Karner, west of Albany, N. Y., in which there exists an abundant growth of pine and where, Dr. Felt stated, southern forms also occur, for example, *Sphex speciosus,* the largest of the digger wasps, unknown northward except in such sandy areas.

The inference being that such forms came exclusively from the south, Dr. Forbes said that it was proper to note that the plants of the Connecticut Valley showed associations with western rather than with southern forms.

Mr. Davis added that sandy areas were plentiful in Connecticut and also westward from Albany, as for instance at Amsterdam.

Mr. Leng read a paper on "Coleoptera of Dry Terrestrial Environment," in which he questioned whether beetles could be successfully classified in respect to environment by the division used for plants, and suggested that such factors as food supply, shelter and the wilful behavior of the beetles themselves might prove to be of paramount importance. He pointed out that few were capable of maintaining life in very dry environment, and that those usually sought moisture by burrowing or other expedients, citing the larvæ of Cicindelidæ, the *Scaritini,* etc., as instances in point. He quoted some instances, however, as the Bruchidæ, found in seeds, the Ptinidæ, in old furniture, drugs, etc., the Dermestidæ, in dry animal matter, where life was maintained under exceedingly dry conditions; and finally mentioned the Tenebrionidæ, as a family specially developed in the dry regions of the southwest, whose thickened integuments and other characters suggested a possible adaptation to arid conditions.

Dr. Felt mentioned a fruit jar full of popcorn in his laboratory at Albany for the last ten years, so dry that no mould had developed in all that time, and yet full of *Anthrenus musæorum,* which had been breeding there continuously during the whole ten years.

Dr. Lutz said that in the Museum a vial full of red pepper and sealed with wax had stood for three years continuously infested with *Sitodrepa panicea.*

Dr. Osburn recalled a lepidopterous larva living in the cast antlers of a Saharan deer.

Mr. Harris, speaking of Cicindelidæ, said that while they differed materially in the amount of moisture preferred, none was really partial to extreme dryness in the larval stage. Those which seemed to like more or less drought were *limbalis, splendida, longilabris, scutellaris, consentanea, rufiventris, hentzii* and *lepida,* but even these he considered mesophytic in the larval period.

Mr. Davis spoke first of the plants of "Dry Terrestrial Environment," mentioning *Hudsonia tomentosa, Opuntia,* and blue bent grasses, as being especially characteristic of such localities. Then taking up the Orthoptera he said some grasshoppers were perhaps in part characteristic of dry localities, as well

as one *Conocephalus* and one cricket. As to the grasshoppers, of which he showed seven species, a cultivated field was really the place where most individuals would occur, few preferring really wet or really dry places. The species shown were:

Spharagemon saxatile, on the exposed lichen-covered rocks at Newfoundland, N. J., Ramapo, N. Y., etc.

Scirtettica marmorata, found in dry sandy places.

Psinidia fenestralis, found in dry sandy places, often with the preceding; the wings of this species are of two colors, yellow and red.

Trimerotropis maritima, occasionally found in dry sandy places inland, as at Lakehurst, Chatsworth and Hornerstown in New Jersey, and, according to Dr. Osburn, on the shores of Lake Erie; the color of this species is in harmony with its environment.

Cercotettix verruculatus, found on exposed rocks like *S. saxatile*, occurs at Dover, N. J.; the specimens exhibited came from Delaware Water Gap; others were found on North Mountain, Pa., with Dr. Lutz.

Schistocerca damnifica occurs not infrequently at Lakehurst, N. J., and further south in dry situations.

Schistocerca alutacea rubiginosa, a small pine barren form of this species, is often quite common at Lakehurst, N. J., in the driest situations.

Conocephalus robustus occurs in meadows, but is also to be found on dry dunes, among the *Hudsonia tomentosa* and tall grasses that grow a little way back from the shore.

Gryllus abbreviatus, often found in the driest situations on barren hilltops and sand dunes, also in cultivated fields, eating tomatoes, but then in small numbers only, this species being one that seldom strays from dry places.

In reply to a question from Dr. Forbes, Mr. Davis added that a dry year was not beneficial to grasshoppers unless preceded by a moist period early in the season, the real benefit to the grasshoppers being the failure of the fungus disease in a dry summer.

This topic being further discussed by Dr. Osburn and Dr. Lutz, it appeared that the greatest development of grasshoppers in species and in individuals was reached in the arid western regions, but that it was particularly a development of the *Œdipodini* (embracing the genera with brightly colored wings).

Mr. Grossbeck said there were few Lepidoptera peculiar to dry situations. *Prionapteryx nebulifera*, which feeds on huckleberry at many stations in the pine barrens and builds a tube under ground and extending seven or eight inches up the stalk, composed of sand grains held together by silken threads, affords an example of special adaptation. Other Lepidoptera exhibit structures adapted to existence in arid regions, such as the corneous protuberances observed in Geometridæ and supposed to serve for breaking through the pupa skin and the baked ground. In *morina*, *glaucina* and *synglorhis* there is also a claw on the fore tibiæ. In *Alcis dislocaria* there is a tibial claw but no frontal protuberance, while in *Cœnocharis* the frontal protuberance exists without the claw. Mr. Grossbeck also spoke of a small geometer found by Dr. Riley on

herbarium specimens, *Eois ptelearia,* as an example of the driest kind of food for Lepidoptera.

Mr. Davis, referring to *Prionapteryx nebulifera,* said that it occurred also at Yaphank, thus extending its previously known range.

Dr. Forbes spoke of the coloration of the forms of arid regions being distinctive, citing *Hemileuca tricolor* as a typical desert form and the bleached-out forms observed in other desert regions, and *Euxoa detorsa, Porosagrotis vetusta,* etc., common in the pine barrens and dominant in light clay-colored forms. *Hypantria cunea,* the fall web-worm, has a variety, *pallida,* which presents similar coloration, making its habits worth discovering. Speaking of structures for breaking through baked ground and dense cocoons, Dr. Forbes said that while he had never seen it done the fact that such structures were infinitely more numerous in species of arid regions and present in fifty to sixty per cent. of the species of Australia were certainly suggestive. He had prepared a list of genera in which this structure was present, and he showed a microscopic mount of the leg of *Lygranthœcia thoreaui,* in which the climax is reached in a flattened tibia provided with six broad flattened spines, forming a most efficient digging tool.

Mr. Olsen mentioned *Mutilla* as a characteristic insect of dry places.

Dr. Osburn said that neither dragonflies nor Diptera could well belong to a xerophytic classification, on account of the larval life being either aquatic or spent in sucking juices. He mentioned certain Syrphidæ burrowing in cactus, *Volucella fasciata* in particular.

Mr. Dow stated that *Lasioderma serricorne* preferred to chew the driest tobacco, and the wonder was how it could raise enough saliva to spit out the juice.

Dr. Lutz, criticizing the preceding speakers and particularly Mr. Leng, said that individual species of plants as well as insects were often found in strange environments, and it had been the endeavor of botanists to show that while this was true of individual species it was never so with the societies of species found associated in certain environments; and such he expected would also prove true of insects. He expressed his gratification at the number of special adaptations for dry environment disclosed by the evening's discussion, and suggested that the number might well be increased when the subject had received further study and certain orders not yet touched upon were considered. He agreed with Mr. Leng that in the case of insects factors not considered by botanists would prove of importance, especially food and light, but he doubted if the wilful behavior of insects would be found strongly operative. In the matter of light he cited especially his own experiments with *Drosophila* and stated that their utter inability to avoid flying towards the light was indisputable.

Mr. Davis and Dr. Lutz discussed the case of *Gryllus abbreviatus* and the disputed relationship between it and *G. pennsylvanicus.*

Dr. Forbes spoke of the black and green forms of the pursley worm, *Deilephila lineata,* green when feeding in a tree endwise to the sun with air blowing all around it, black when on bare ground without shelter from the sun.

He said that theoretically the black pigment converts the sun's rays and saves the delicate internal organs from injury, as in the negroes.

Mr. Davis said that two colors were found in the caterpillars of *Sphecodina abbotii*, but no differences could be detected in the adults.

MEETING OF JANUARY 7, 1913.

The annual meeting of the New York Entomological Society was held January 7, 1913, at 8.15 P. M., in the American Museum of Natural History, President Dr. Raymond C. Osburn in the chair, with seventeen members and one visitor, Dr. Frederick A. Lucas, Director of the American Museum, present.

Mr. Harris, for the Nominating Committee, proposed the following candidates for officers for the ensuing year:

President—Raymond C. Osburn.

Vice-President—Charles L. Pollard.

Secretary—Charles W. Leng.

Treasurer—William T. Davis.

Librarian—John A. Grossbeck.

Curator—Frank E. Lutz.

Executive Committee—Charles W. Leng, Edward G. Love, Charles E. Sleight, George P. Engelhardt, E. B. Southwick.

Publication Committee—Charles Schaeffer, Frank E. Lutz, Harry G. Barber, John D. Sherman, Jr.

Delegate to Academy of Sciences—William T. Davis.

There being no other nominations, the by-laws were on motion suspended and the secretary, as instructed, cast an affirmative ballot electing the before-mentioned candidates.

Mr. Bird read a paper on "The Breeding of *Papaipema stenocelis* Dyar Within Our Fifty-mile Radius," in which he stated that this very distinct and striking noctuid, described in our JOURNAL in 1907 from a specimen taken at Baltimore, probably captured at light, was again found by Mr. Buchholz in 1911 at Lakehurst. Knowing the food plants of the other members of the group, he surmised that *stenocelis* would be found breeding in the stem or root of some unfamiliar fern. Accordingly, on July 20 last he visited Lakehurst, and noticing orange-colored frass on the sand beneath a fern (*Woodwardia virginica*), discovered the larvæ feeding in the running rootstocks, which were about as large as a pencil. From these larvæ two specimens were bred, which were exhibited with blown specimens of the larvæ. Mr. Bird called attention to the chitinized plates on the tubercles of the eleventh segment, which he pointed out were larger than usual; and closed by predicting that the metropolis of this species would be found in the vicinity of the Dismal Swamp, and the greatest number of specimens in the month of October.

President Osburn read a paper on "Sexual Dimorphism in Diptera," dwelling particularly on the differences in the form of the head and in the eyes, holoptic in ♂, dichoptic in ♀, and frequently with definitely limited patches of larger facets in ♂. He spoke also of the feathery antennæ of some ♂ Culicidæ,

the modified ♀ mouth parts of blood-sucking species, the expanded front legs of ♂ *Platychirus*, the expanded front and middle legs of ♂ *Pyrophaena*, the expanded first tarsal joint of ♂ Simulidæ; and the color differences frequently observed in the sexes, the male usually being the more highly pigmented, its yellow markings when present being larger and its metallic color more pronounced. The hairs also, he said, were usually better developed in the male, the spinous hairs stronger, the bristles of the antennæ and the hairs about the eyes usually longer. These differences were, however, not without exceptions, and often were much more marked in one species than in others. The appendages of the legs of ♂ Dolichopodidæ and their amorous dances, described by Aldrich, were mentioned as well as the male modifications of the posterior ventral segment. In closing, Dr. Osburn referred to the various efforts that had been made to explain sexual dimorphism since Darwin's conception of sexual selection became in part ncessarily modified; the classification by Cunningham of the structures involved into functions of combat, allurement and the different conditions to which the two sexes are exposed; the theory of Morgan that such structures are in part the product of sex-linked heredity and so appear in only one sex, as foreshadowed by Geddes and Thompson in their expression "outcrops of a male as opposed to a female constitution."

Specimens illustrating the various structures and color differences mentioned were exhibited and further explanations were given during the exhibition.

Dr. Osburn's paper was discussed by Messrs. Angell, Davis and Bagg, and in reply to their questions Dr. Osburn said that in the absence of colonial forms there was no possibility of neuters existing, but that, as suggested by Mr. Davis, undeveloped individuals, as in Membracidæ, might occur, and one would then expect to find intermediate conditions of color. The secondary male characters would naturally come on with the development of sexual maturity. Dr. Osburn also in this connection referred to the higher rate of oxidation stated by Geddes and Thompson to be normal in males of all species.

In reply to Mr. Bagg's question, Dr. Osburn said that the attitude of workers in regard to scientific names for the experimental species resulting from the work of students of evolution and mutation varied; and though such had been applied in some cases to Lepidoptera, he would personally be opposed to such a course.

Mr. Sleight exhibited specimens of inflated larvæ resting in natural poses on the leaves of the food plant, prepared by Mr. Hallinan and said the process consisted in inflating as usual, then filling the larvæ with sand so as to permit of posing them without damage, then drying and pouring out the sand.

Mr. Davis, referring to the unusual warmth of January 6, exhibited a specimen of the moth *Platypena scabra*, found flying in front of his home on Stuyvesant Place, Staten Island.

During the service of refreshments Dr. Lucas read extracts from "The Book of Bugs," by Harvey Sutherland, humorously detailing the estimable and other characters of cockroaches and several members contributed notes on the entertaining features of entomology.

Mr. Wintersteiner contributed local specimens of *Tropisternus mixtus*, *Creniphilus digestus*, and *Berosus aculeatus* to the Local Collection, and a note on the occurrence of *Brachybamus electus* on the water plant *Myriophyllum*.

Mr. Wintersteiner also placed on record the breeding of a species of the Dascyllid genus *Cyphon* from aquatic larvæ. The larvæ were found in March in a stagnant pond at Forest Park, among dead leaves under a tree, and were about ten mm. long. Two dozen were taken home and kept in a glass vessel, but on account of their cannibal habits two only reached maturity; the pupæ were fastened to the glass by threads from the anal extremity and hung head downwards.

JOURNAL

OF THE

New York Entomological Society.

VOL. XXI. JUNE, 1913. No. 2

CRITICAL NOTES ON THE SPECIES OF HALIPLIDÆ OF AMERICA NORTH OF MEXICO WITH DESCRIPTIONS OF NEW SPECIES.

BY CHRIS. H. ROBERTS,

NEW YORK, N. Y.

The writer has for several years been amassing material and studying the structure of these very interesting water beetles with the intention of writing a review or synopsis of the family.

The recent publication of Mr. Robert Matheson's paper[1] perhaps makes such a work unnecessary, at this time, and I will therefore confine myself to notes, critical or otherwise, on the previously recognized species and the description of others not seen, or overlooked, by previous authors. In the study of the family I have examined, individually, literally thousands of specimens and have had before me, with few exceptions, anywhere from six to hundreds of specimens of each species noted.

I have had before me examples of all the species described up to the publication of Mr. Matheson's paper, and all of his newly described ones with the exception of *Haliplus deceptus, mimeticus* and *vancouverensis,* which three species I have not seen, or am unable to recognize.

The first two should not be hard to determine, with the aid of his plate of elytra, but the description of *vancouverensis* is so indefinite that it would fit several species when all reference to color markings,

[1] JOURNAL OF THE N. Y. ENT. SOCIETY, Vol. XX, page 156, September, 1912.

or the lack of them, the character of the punctuation and the form and sculpture of the metasternum is left out, and no comparative notes are given. Unfortunately I have not been able to see his types.

The structural characters most useful in separating the species are the form and markings, such as depressions, margins, etc., of the prosternal process, metasternum and coxal plates as well as the shape and structure of the parts of the upper surface of the body. In fact the structure of the under body seems to vary very little among individuals of a species, which fact was not at all appreciated by Mr. Crotch, as shown in his "Review," and little made use of by Dr. Leconte.

If the mid-metasternum of a species is margined, and that margin extends backwards so as to reach, or approximate, the anterior suture of the antecoxal piece and in another species the margin does not reach more than half way to the suture, the two species could be almost certainly separated by a reference to that one character alone. So also can the shape of the coxal plates, whether rounded or angulate, be used with confidence.

Punctuation, both on the upper and under surfaces, especially as to whether the punctures are large and shallow, or small and deep, is quite characteristic and constant.

The study of large series of specimens of species easily recognized from some decided structural character has led me to value maculation rather highly as an aid in determining species. While spots may be dilated, sometimes even to the point of coalescence, or lines lengthened, or either of them diminished almost to obliteration, the character of the color markings, that is whether lines or spots, or even the pattern, will usually be indicated.

I do not mean to imply that some species do not mimic others rather closely in pattern of maculation, but in that case, when structural differences are found, some modification of the markings will be observed which, while perhaps slight, will be found constant.

Variation in color markings along the above lines is not at all uncommon in the species of *Haliplus,* but in *Peltodytes* the maculation is remarkably constant and may be almost absolutely relied upon, as also may the color of the hind femora.

In the latter genus if one specimen has seven spots on each elytron and another six, or if one has a sub-humeral spot and another has

none, you may be sure, in either case, that you are dealing with two distinct species and structural characters will be found to support the varied maculation.

The males can always be separated from the females, even when determining the smallest species, by the form and vestiture of the front and middle tarsi.

In the males the first three joints are shortened and thickened, more or less pedunculate, or produced, in many species, and are evidently pubescent beneath, while the females have the joints simple and more slender.

These male characters vary among the different species but are not very useful for specific definition, except in a few instances where the modification is out of the ordinary, as they are entirely comparative as to degree of thickening or production of the joints. For the same reason I do not find the emargination of the labrum, mentioned by Mr. Matheson, of much value in specific identification. An analysis of his descriptions shows, in *Haliplus*, one species as "truncate," seven "slightly emarginate," five "emarginate" and one "strongly emarginate"; in *Peltodytes*, one "scarcely emarginate" and seven "not emarginate." This leaves too much to individual estimation and view point to be of value, and might lead to confusion unless used in comparing nearly related species as emphasis to other characters, and even here the differences are too slight, so far as my observation goes, to be appreciated.

In the following paper are described one new species of *Brychius*, eleven of *Haliplus* and six of *Peltodytes*, bringing the total of our described species of Haliplidæ up to forty-three. I have no doubt but that careful collecting, especially in the west and south, will bring to light other undescribed species.

In concluding these prefatorial remarks I wish to acknowledge my debt to the late Frederick Blanchard.

We examined and studied together the Leconte types and other material at the Cambridge Museum, and I shall not soon forget the week spent at his home in the study of his specimens, aided by my compared specimens and the notes made on our museum trips. His enthusiasm was contagious and his interest unflagging as my study progressed, and his habit of close observation made his suggestions, and always frank criticism, of great value to me. My acknowledg-

ments are also due to the authorities of the United States National Museum, having in charge the collections of insects, for the loan of all its material, to Mr. Charles Schaeffer, for the loan of specimens collected by him in Texas, and to Messrs. Chas. W. Leng, John D. Sherman, Jr., and J. B. Wallis, for the use of their specimens on the broad principle of "help yourself to anything you want." The careful collecting of Mr. J. B. Wallis, of Winnipeg, Manitoba, added two new species to our known fauna, and his liberality large series of specimens to my cabinet where, in several instances, my material heretofore had been meager.

BRYCHIUS Thomson.

In describing this genus the use of the expression "thorax quadrate" seems to me inappropriate as far as our species are concerned and also as to the *elevatus* Panz., the only European species I have.

The thorax, while not obliquely narrowing from base, is decidedly transverse, being nearly, if not quite, one half wider than long.

Brychius parvulus new species.

Oval, strongly convex laterally and longitudinally, pale olive green.

Size: length 2¼ mm.; width 1¼ mm.

Head with the apical half pale yellow in color and faintly rugose and the basal half infuscate and finely punctured; broad between the eyes; eyes round and quite prominent; antennæ pale yellow. Pronotum transverse; sides slightly sinuate and finely margined; not obliquely narrowed towards the apex; depressed at base between the depressions, or striolæ; striolæ deep and short, not extending over one third the length of pronotum; finely, closely and evenly punctured, except a narrow space each side where the punctures are more scattered; an infuscate area between the impressions, darkest at base, gradually fading to apex and leaving the sides pale yellow.

The elytra, viewed from the side, are convex, decurved at about two thirds from base, strongly convex laterally and immaculate; punctures of the striæ fine, not deep and rather irregularly placed; some of the punctures darkened, but not sufficiently so or regularly enough to produce stripes; apices gradually rounded and obtusely angulate at suture.

The under surface of body and legs are uniformly pale yellow, except the last abdominal segment. Prosternal process broadest at base, very gradually narrowed to the front coxæ, and beyond them suddenly and strongly constricted; flat; impunctate; without margins.

Hind coxæ broadly rounded and without sign of exterior or sutural angles; punctures shallow and not closely placed.

Owing to the manner in which the specimen is mounted it is impossible

to see the metasternum and, being an unique, I have not the temerity to remount it.

One specimen, a female, from San Mateo Co., California—"Baker."

Type from, and deposited in, the collection of the U. S. National Museum, Washington, D. C. This is a very interesting species, which would scarcely be taken for a *Brychius* at first glance, its form reminding one very much of a small *Berosus*, especially when viewed from the side.

Haliplus connexus Matheson.

Mr. Matheson has very well separated this species from its nearest ally, *fasciatus* Aubé.

In addition to the characters mentioned by him I may add that in *connexus* the mid-metasternum is more broadly impressed each side, almost lobed, and the margin is more abbreviated, not reaching the suture of the antecoxal piece, as is the case in *fasciatus*. The punctuation is more shallow throughout, especially so on the coxal plates.

The males have the front and middle tarsi more slender, the joints shorter and proportionately more pedunculate.

Both species have the apex of pronotum finely margined each side, obsolete at middle. This margined apex separates the two species from the *triopsis* group as well as the absence of any anterior black spot.

Haliplus punctatus Aubé.

From the specimens so named I have seen in collections there seems to be a misconception as to what this very distinct species is. I may, therefore, be pardoned for giving a translation of Mr. Aubé's French description, as follows:

"Length 3¾–4. Breadth 2⅓ mm.

"Oval, rounded, convex, slightly depressed about the shield and ferruginous. Head quite strongly punctured, antennæ and palpi testaceous.

"Thorax ferruginous, with a round black spot at the middle of the front margin: one and one half times as wide as long, strongly emarginate in front where it is narrower, sinuate at base the sides of which are slightly oblique, the middle of the base prolonged in a point upon the elytra; sides rectilinear and oblique, front angles acute and strongly diminished, hind angles almost right angles.

"Thorax covered with large, deep punctures except the center of the disc which is smooth within a small limit.

"Elytra oval, wider in front than the base of the thorax, very much dilated and then narrowing quite abruptly up to the extremity which is slightly oblique, terminating in a point. Elytra with ten rows of large, deep punctures, especially large and deep in front where the striæ are confused; near the suture a line of shallow punctures close together with a few similar punctures widely separated in each interval. Elytra with six black spots quite well defined, often confluent, arranged as follows: one outside a little behind the shoulder, another a little farther inside and behind the preceding more or less confluent with the suture; two more on the same horizontal plane about two thirds the way down the elytra; finally back near the extremity are two others arranged slightly obliquely from the outside towards the inside and from below above, of which the internal unites with the suture. The suture is also black terminating in a large lance head; the base is also largely black for five sixths of the way from the suture.

"Often all the spots, suture and base have points of contact of more or less extent.

"The reflexed portion, under side of the body and feet are ferruginous.

"Posterior coxal processes with large, deep punctures."

Mr. Aubé calls attention all the way through to the deep and coarse punctuation, ferruginous color and liability to confluence of the spots. In examining about one hundred and fifty specimens of this species I find the tendency to confluence so strong that in a majority of cases the species has a trifasciate appearance, and in no instance have I seen a specimen where there were not some points of contact in the maculation.

This character, its strong, deep punctuation and its ferruginous color, taken together, should readily separate it from *triopsis*. All the specimens I have seen are from Florida, Texas and Louisiana.

Mr. Matheson certainly could not have had this species before him in making a redescription. It does not fit the species, nor does his plate correctly represent it; but he more nearly characterizes the species described farther on as *ochraceus* and which is found in the middle and eastern states.

Haliplus suturalis new species.

Oblong-oval, convex, fulvous.

Size: length 3¼–3¾ mm.; width 2–2¼ mm.

Head very finely and closely punctured, except a small space at vertex which is impunctate; eyes large; antennæ testaceous. Pronotum rather finely and evenly punctured; punctures coarser than those of head, but not so coarse as the elytral punctures; a small round black spot at center of anterior margin.

Elytra broadest just below the humerus, gradually rounded and narrowing to external apical angles, which are obtuse; apices slightly oblique, not den-

ticulate, interior angles acute; striæ composed of closely placed punctures, fine and shallow towards the suture, coarser and deeper at the middle and sides and which are confused near the base; sutural interval with a double row of very fine and closely placed punctures and the other intervals with single rows of fine punctures not so closely placed; maculate with eight small spots on each elytron placed as follows: one centrally on the base, one subhumeral, one median and below this one a sublateral, a submedian and a sutural one placed nearly horizontally, the last coalescent with the suture, below these three two more, the one placed near the suture and the other obliquely below near the lateral margin; the base is very narrowly black from suture to just beyond the basal spot; the suture narrowly black for its entire length and the apices tipped with black in the usual way at the sutural angle. Under surface of the same color as the upper with an infuscate patch about the front and middle coxæ, and the posterior margins of the abdominal segments also infuscate.

Prosternal process with the sides parallel for nearly their entire length, slightly excurved near the declivity, quite strongly margined laterally and with the apex finely margined; slightly convex and finely, densely and evenly punctured between the margins.

Mid-metasternum margined for about two thirds the distance to the suture of the antecoxal piece with a few scattered punctures between the margins.

Hind coxæ evenly punctured with shallow medium-sized punctures, broadly rounded from exterior angle to suture where the angles are obtuse.

Male front and middle tarsi with the second and third joints shortened and slightly produced apically; claws long and slender.

Male and female types from Albuquerque, New Mexico (H. F. Wickham) are in my collection.

Other specimens before me are from Shovel Mt., Texas (F. G. Schaupp), and from "Tex." (U. S. Natl. Mus. Coll.).

In a dozen or more specimens there is scarcely any variation except that in some female specimens, the interior subapical spot is joined to the suture by a narrow point or line.

At first I hesitated to describe this species, thinking it might be Mr. Matheson's *deceptus;* but even taking into account his very vague description there seem to be several decided points of difference. The smallest specimen of *suturalis* is not as small as his *deceptus;* the color is not pale yellow; the spot on pronotum is not rufous; a Carl Zeiss, 27, hand lens shows no denticulation to the apices of elytra, nor is the exterior angle so acute as represented in the cut on his plate of elytra. *Suturalis* has no close relationship to either *borealis* or *lewisii,* from which species Mr. Matheson separates

by comparison his *deceptus,* could not be confused with them, but belongs to the *triopsis* group.

Haliplus leopardus n. sp.

Broadly oval, convex, ochraceous.

Size: length 4–4¼ mm.; width 2½–2¾ mm.

Head finely punctate, more closely towards the front, vertex nearly smooth a few punctures only appearing; eyes large, round and moderately convex; antennæ color of head and thorax.

Pronotum evenly and closely punctured with deep, but not coarse, punctures; not depressed at base; a large black spot placed centrally on the front margin.

Elytra broadly oval, widest just below the humeri and narrowing very gradually to the exterior apical angle; apices slightly oblique, not at all sinuate, finely denticulate and with the angles obtuse; maculate with seven large, uneven black spots situated as follows: one subhumeral, one centrally just above the median line, three submedian placed nearly horizontally and equidistant from lateral margin to suture, the sutural one coalescent with margin, two subapical, the exterior near side margin and the interior obliquely above, which latter is elongate and connected by an arm to the suture; base broadly margined with black from suture to very near the lateral margin and produced downward upon the elytra at center; suture broadly black from base to median coalescent spot and from it more narrowly to apex, terminating in the usual triangular spot; striæ composed of rather large, shallow punctures, smaller and less deep near the suture; sutural interspace with a double row of small punctures and other interspaces with single rows of very fine ones.

Under surface of the same color as upper, with the joints of legs and posterior margins of abdominal segments infuscate.

Prosternal process very slightly convex laterally, finely, evenly and not deeply punctured, parallel from base to apex, where it is narrowly margined; side margins thick, rather flat and distinctly punctured. Mid-metasternum margined for about two thirds its length, the anterior third of which is much thickened and somewhat arcuate; finely and deeply punctured between the margins, except a small space at center.

Hind coxal plates with the apices broadly rounded from exterior angle to apex and slightly sinuate from there to suture, where the angle is rectangular.

Middle trochanters in both male and female deeply punctate on lower side.

Male front and middle tarsi with the joints thickened but not at all pedunculate; claws of both male and female noticeably shorter than those of other species in the *triopsis* group.

Types, male and female, from Egremont, Mass. (Roberts), in my collection.

I have seen specimens from Tyngsboro (Blanchard) and Cam-

bridge (U. S. Natl. Mus.), Mass., and from N. Y. City and Riverside, Conn. (Roberts).

Thirty odd specimens before me show little tendency to variation in size or markings. When any coalescence of the spots appears it is by lines extending perpendicularly, following a stria, rather than transversely with a tendency to form bands, as in *punctatus*.

The species *triopsis, punctatus, suturalis* and *leopardus,* with perhaps *deceptus,* form a natural group from the similarity of structural characters and the presence of the black spot on anterior margin of the pronotum. As in *fasciatus* and *connexus* many of the specimens show more or less distinct traces of two spots situated each side on base of pronotum. *Leopardus* should at once be separated by its large size, large spots, more rotund shape and the punctured trochanters, *suturalis* by its color, more orange than lemon yellow, its small spots and size, the very narrow black border to the suture and base of elytra and absence of denticulation to the apices.

Large series of both *triopsis* and *punctatus* show considerable variation in size, the former ranging from 3½ to 4 mm. in length and from 2 to 2½ mm. in width while the latter varies from 3 to 3¾ in length and from 1½ to 2 in width, *punctatus* being rather the smaller and more slender of the two.

In *triopsis* the pronotum is distinctly impressed at base while in *punctatus* it is not, or scarcely perceptibly so.

The elytral punctures of the former are coarse and shallow, while in the latter they are deep and closely placed.

In *punctatus* the prosternal process is more sharply margined and these margins are more decidedly roughened by the deeply and closely placed punctures, while the front or apical margin is quite distinctly and sharply angulate at middle; margins of mid-metasternum more sharp and fine and not so widely separated; denticulation of apices of elytra finer, almost obsolete; hind coxæ not so broadly rounded towards the suture, the interior angle being quite sharp.

The punctuation in *punctatus* is deeper and more closely placed all through; the color ferruginous, not testaceus or fulvous; the spots large and more or less dilated and frequently so confluent as to form irregular bars across the elytra. While *triopsis* is widely distributed, being found almost everywhere east of the Rockies, *punctatus* seems only to be found in the south, being quite common in Florida.

Haliplus cribrarius Lec.

There are at least two, possibly three or four, species mixed in collections under this name, and in order to help to distinguish it from the others I call attention to some characters not mentioned by either Leconte, Crotch or Matheson.

The prosternal process is not merely flat and without margins, but it is broadest at base, slightly narrowing to just beyond the front coxæ, where it is strongly constricted, and then broadens over the declivity, which is not sharp but gradually rounded; beyond the constriction it is finely, but distinctly, margined at the sides and across apex. On account of the gradual rounding of the process towards the front, instead of being sharply declivous, the apical margin is carried well forward and might be overlooked. The mid-metasternum is tumid between the middle coxæ and behind them very deeply depressed, and very finely and briefly margined.

Hundreds of specimens examined show scarcely any variation in the above characters, or in the black markings, except as to intensity, but in size there is considerable of a range. In one netful I have taken males measuring from 3½ to 5 mm. in length and from 2 to 3 mm. in width, and females vary proportionately.

Specimens I have seen are from Manchester, Vt. (Roberts); West St. Modist, Lab. (E. Doane); Randolph, N. H. (Sherman), and Eagle Harbor, Lk. Sup. (Schwarz).

Haliplus nitens Lec.

I entirely agree with Mr. Matheson that this species is not "merely a pale variety of *cribrarius*," as stated by Mr. Crotch in his review.

It seems to have quite a range in habitat, as I have in my collection two female specimens collected by the late F. G. Schaupp at Shovel Mt., Texas.

Haliplus subguttatus new species.

Oval, convex, ferruginous.

Size: length 4–4¼, width 2½–2¾ mm.

Head evenly, finely, closely, but not deeply, punctate, except a narrow subbasal space impunctate; a narrow blackish or infuscate space at base between the eyes; antennæ color of head.

Pronotum finely and unevenly punctured from side to side apically, a double row of deep black punctures at base, with a rather broad discal space nearly impunctate; a more or less extended deeply infuscate area at apex.

The anterior of the double row of basal punctures is the shorter and composed of smaller, irregularly placed ones, while in the posterior row they are regularly placed and much enlarged towards the side margins.

Elytra oval, widest at middle, gradually rounded to exterior angle and with the apices slightly oblique, not sinuate, interior angles obtuse; striæ composed of deep blackened punctures, largest at base and gradually diminishing to apex; sutural interspace with a single row of small punctures closely and evenly placed, the remaining intervals having similar ones more widely separated; maculate with elongate spots or dashes of black situated as follows: one nearly touching the base between the third and fourth striæ, one subhumeral between the fifth and sixth, one obliquely below this between the third and fourth, three below this last, placed horizontally, the inner extending in a patch from suture to second stria, the middle between the fifth and sixth and the outer between the seventh and eighth, below these four more subapical between the second and third, fourth and fifth, sixth and seventh, this last very short, and a patch from eighth to lateral margin; suture very narrowly black from base to apex, base immaculate. Underside of body ferruginous with the joints of legs and posterior margins of abdominal segments infuscate.

Prosternal process flat, scarcely wider at base than apex, somewhat constricted before front coxæ, apex finely margined, with deep, closely placed punctures diminishing towards the apex. Mid-metasternum almost flat, without margins, not tumid in front, sometimes with a slight depression at center; punctuation the same as that of the prosternum with the usual smooth space at center. Hind coxæ with moderate-sized, deep punctures evenly placed; apices broadly rounded exteriorly, nearly truncate from middle to suture.

Front and middle tarsi of male with the joints not much shorter than those of the female, slightly compressed and quite evidently, though not strongly, pedunculate.

Male and female types from Tyngsboro, Mass. (Fredk. Blanchard) in my collection.

Dr. Leconte separated this species under the above name in manuscript, but never published the description, being perhaps deterred by Mr. Crotch's criticism that it was only a dark form of *cribrarius*. It is unquestionably distinct from that species.

Twenty-eight examples before me vary little in form, punctuation or structural characters, but there is a wide range in maculation, the tendency being a reduction in the length of the spots or a fading away even to the complete obliteration of some of them.

In the male type the extreme intensity of marking is illustrated, while in the female type the spots are all reduced, the basal entirely wanting, and of the three submedian ones the inner is not coalescent with the suture and the outer has entirely disappeared. I have, how-

ever, a female almost identical in markings with the male and *vice versa*. Other localities than that of the types from which I have seen specimens are Antigonish, N. S. (J. M. Swaine), Montreal, Que. (Chagnon), Frazer Valley, B. C. (Weidt), Aweme (Criddle), Beachland, Husavick and Winnipeg (Wallis), Manitoba.

Haliplus gracilis new species.

Form oval, narrow, sides nearly parallel, color pale testaceous.

Size: length 3½–4, width 2–2½ mm.

Head punctured with extremely fine, shallow, scattered punctures; eyes large and rather prominent; antennæ color of head.

Pronotum in front with deep small punctures not closely placed, base with confused rows of coarser punctures, disc smooth; sides quite strongly compressed apically behind the eyes and lightly impressed each side of middle at base; side margins wider than near allies; apex slightly, if at all, infuscate.

Elytra widest just below the humeri, very little wider than at base; sides nearly parallel and somewhat flattened; apices oblique and slightly sinuate, sutural angle acute; striæ composed of moderately large, shallow, brown punctures, very much diminished apically and laterally; maculate with pale brown spots placed as follows: two antemedian placed obliquely, one submedian and two below this one subapical, these spots being at no time prominent, frequently evanescent. Under surface and legs bright fulvous.

Prosternal process flat, sides parallel to front coxæ, greatly constricted beyond them and then widely excurved, not steeply declivous in front but broadly arched; without side or apical margins and unevenly punctured with different sized punctures, coarsest near base.

Mid-metasternum broadly impressed behind middle coxæ, not tumid in front, finely but distinctly margined on the sides and with a few scattered punctures in front and at the sides. Usually there is a shallow pit, more or less distinct, placed centrally upon the anterior suture of antecoxal piece.

Hind coxæ with deep, medium-sized punctures evenly placed; apices broadly rounded from exterior angle to apex thence feebly sinuate to suture, where the angles are acute and slightly produced.

Male front and middle tarsi thickened, but not at all pedunculate.

Male and female types from Corvallis, Oreg. (A. R. Woodcock), in my collection.

All the specimens I have seen, about one hundred and fifty, are from the same locality and do not vary except as indicated in the description.

This species is the most slender in the *cribrarius* group.

Haliplus cylindricus new species.

Elongate, regularly oval, convex, color pale olive yellow.

Size: length 4½ mm., width 2¼ mm.

Head finely, evenly, lightly punctured except at vertex; eyes large, round and prominent; antennæ color of head.

Pronotum with fine deep punctures apically, extending back to disc; disc with a few scattered punctures; base with a double row of coarse black punctures; a distinct median depression across disc basally.

Elytra without markings; widest at shoulders, nearly parallel at sides, with the apices obliquely truncate and angles obtuse; striæ composed of moderate-sized, deep, blackened punctures not larger than those at base of pronotum and gradually reduced in size almost from base to apex; striæ not confused apically. Under side and legs a dull or smoky yellow.

Prosternal process widest at base, somewhat, not sharply, constricted before the front coxæ, evenly, deeply, closely punctate; sides and apex finely but distinctly margined. Mid-metasternum nearly flat, sparsely punctate, without margins and with a round pit at center.

Hind coxæ with moderately deep, evenly placed, medium-sized punctures; apices evenly rounded to suture where the angle is nearly rectangular.

Male front and middle tarsi a little thickened and feebly pedunculate.

Four specimens from Twin Lakes, California, were sent me by Mr. Ralph Hopping, to whom I am much indebted for a gift of the types ♂ and ♀, which are in my collection.

Haliplus rugosus new species.

Broadly oval, widest at middle, not strongly convex, rufous.

Size: length 4 mm., width 2½ mm.

Head finely, evenly not deeply punctate except a small space at vertex impunctate; eyes large, round, well separated, rather prominent; antennæ rufous.

Pronotum finely, evenly, densely punctate; distinctly impressed at base before the scutellum; a narrow median line at apex infuscate.

Elytra uniformly rufous, except a small central patch of testaceous extending from the sixth stria to lateral margin; broad, nearly flat dorsally, with the sides gradually rounded and with the lateral margins serrulate to the exterior apical angle; apices oblique and feebly sinuate with the sutural angle obtuse; strial punctures moderately large and deep, those of the sixth to tenth being largest and quite distinctly separated while those of the first five are confused and confluent giving the whole basal area between the humeri, and extending fully one quarter of the distance to apices, a decidedly rugose appearance; punctures strongly diminished apically; fine punctures of the dorsal interspaces numerous, crowded and mixed up with those of the striæ.

Under surface nearly unicolorous with the upper.

Prosternum with the sides slightly constricted from base to front coxæ and thence strongly excurved to apex, which is one third wider than base; sides with heavy, thick margins, apex less thickly margined; slightly convex laterally, strongly arched apically and closely, finely, deeply punctured between the margins.

Mid-metasternum with thickened margins continuing in alignment with those of the prosternum and reaching the suture of antecoxal piece; interspace nearly flat and finely punctured.

Hind coxal plates with moderately fine, evenly placed, deep punctures; apices broadly, separately rounded.

Abdominal segments distinctly margined posteriorly and with the usual rows of punctures very fine, almost obsolete.

Male front and middle tarsi thickened and slightly pedunculate.

The unique type has been in my collection for many years and has no more definite locality label than "California."

Another specimen in the Leconte collection is labelled "Minori" Cr. Mss.

I do not see how this very distinct species can be confused with any other.

Haliplus tumidus Lec.

This species varies greatly in color and markings. In the twenty-eight specimens before me there are all grades of maculation and color from testaceous with a narrow sutural stripe and small central blotch light brown, to a very dark, almost entirely piceous, color, with the markings scarcely discernible. The most distinctly marked form I have seen may be thus described.

Color testaceous.

Pronotum broadly infuscate before and behind. Elytra with base, suture, a large central blotch joining an interior discal spot, a larger posterior spot a little exterior to the discal one, a subsutural, still more posterior joining suture, and an outer subapical spot piceous.

One character, apparently overlooked by Dr. Leconte, that at once distinguishes this species is that the elytra at the humeri are finely, distinctly asperate.

The elytral margins are distinctly serrate and the apices serrulate.

The hind coxal rings are rounded exteriorly, inflexed, inwardly sinuate and with the sutural angle acute and produced.

Dr. Leconte's description of the metasternum as being "with a deep square impression" is scarcely accurate. When a specimen is properly mounted from the side, so as to show the entire mid-metasternum, it will be found to have a deep impression each side, strongly margined exteriorly and with a more or less distinct short ridge in center. In spite of color variation the structural characters are so distinct that the species should be easily recognized.

All the specimens I have seen are from Texas, and nearly all from the one locality, Brownsville.

Haliplus concolor Lec.

This species is more oval in form than *tumidus* and of a deep ferruginous color.

In the six specimens before me, five being from San Diego, Cal. (Soltan), and one from Los Angeles, Calf. (Van Dyke), the size ranges from 2½ to 3½ mm. in length and from 1½ to 2¼ mm. in width.

Two specimens, a male and female, show indistinct maculation after the pattern of *tumidus*, the others are entirely unicolorous.

The pronotum is quite evenly, finely punctured and somewhat convex from apex to base, giving the disc a "full" appearance. The elytral striæ are not so deeply or coarsely punctate as in *tumidus;* the punctures very much finer towards the suture and apices and there is no sign of asperity at the humeri, but on the contrary only a few fine punctures appear at that point leaving them almost bald and shining; the side margins are serrulate, gradually rounded, and the apices feebly oblique.

The prosternal process is not sulcate, the sides being parallel for almost their entire length; sides and apex finely, sharply margined.

The mid-metasternum is deeply impressed each side, leaving a distinct short ridge between, with the margins very fine and nearly attaining the suture of antecoxal piece.

Hind coxal plates with small, deep punctures evenly placed and with the apices rounded to beyond the center, then slightly inflexed but scarcely sinuate, with the sutural angle rectangular but not produced.

In undertaking a re-description of this species Mr. Matheson has blundered in not recognizing the species before him, as was the case with *punctatus.*

His description, such as it is, does not agree with the type nor would my specimens fit into it.

My suspicions were aroused by his giving the locality of his specimen as Brownsville, Texas, the home of *tumidus,* while all the specimens of *concolor* I had seen were from California.

Writing to Prof. Wickham, who has the specimen described by

Mr. Matheson, he answers that after careful examination he determines it as undoubtedly *tumidus.*

It is hard to tell from Mr. Matheson's vague descriptions what he has before him, but from the cut on Plate V. I am inclined to think that his *mimeticus* may be *concolor.*

Haliplus confluentus new species.

Oval, polished, dark ferruginous.

Size: length 3 mm., width 1½ mm.

Head evenly punctured with small, rather deep, not closely placed punctures; narrow between the eyes, which are very large and oblong oval; antennæ color of head.

Pronotum finely, evenly punctured, those of the apex being as fine as those of the head and closely placed, while those of the basal portion are a little coarser and not so closely placed; lightly impressed at base and with a piceous patch extending from apex to base, broadening on base; sides ferruginous.

Elytra highly polished, broadest just behind the humeri, gradually narrowing to the apices, which are not strongly oblique, feebly sinuate, with the sutural angle almost rectangular; punctures of the striæ much coarser than those of the pronotum, shallow, well separated, finer apically but with the rows distinct and punctures not confused; intervals, except the sutural, with very fine punctures widely separated and lightly impressed; base and suture broadly piceous and with patches of the same color placed subhumerally, medianly, submedianly, anteapically and laterally, all more or less confluent, leaving small spots only of the ferruginous ground color showing; surface highly polished.

Under surface dark ferruginous and the punctuation, considering the size of the species, is very coarse and deep throughout.

Prosternal process with the sides parallel for nearly their entire length, slightly wider in front and strongly margined, especially towards the apex, with the apical margin evident; convex laterally with a few very fine punctures upon the convexity.

Mid-metasternum strongly margined; margins continuing in line with the prosternal ones, divergent apically, slightly thicker basally and nearly reaching the suture of antecoxal piece, with a few very fine punctures between them.

Hind coxal plates broadly rounded, slightly incurved interiorly, with the sutural angle sharp.

Abdominal segments with the usual rows of punctures deeply impressed.

Male front and middle tarsi with the joints thickened, not pedunculate.

In the female type the dark markings are not quite so much extended as in the male, more of the ground color appearing; but the markings are equally confluent, not reduced to spots.

Male and female types from Taylor Co., Fla. (Mr. W. S. Genung),

are in my collection. Other localities are Sanford and Jacksonville (Mr. Genung) and Tampa, Florida (U. S. Natl. Mus. Coll.).

This is quite a distinct species, smaller than either *tumidus* or *concolor*, and easily distinguished from *lewisii* and *borealis* by both color and punctuation. It has no thoracic impression, or plica, as have all the species in the *ruficollis* group, except *borealis*. The upper surface is exceptionally polished, and the extent of the very dark markings give it an almost black appearance.

Haliplus annulatus new species.

Oval, very small, rufous.

Size: length 2–2½ mm.; width 1¼–1¾ mm.

Head very finely, not deeply, punctured; eyes large; antennæ color of head.

Pronotum finely, densely punctured, scarcely less so on disc, impressed at base, slightly infuscate along the apical margin.

Elytra widest at about the middle, sides gradually rounded, apices rounded exteriorly and very feebly oblique to the sutural angle, which is rectangular; punctures of the striæ small, not deep, largest at the sides and gradually smaller to the sutural stria, but not strongly diminishing apically; punctures of the interspaces very minute, scarcely discernible; the markings consist of bars or bands of black placed on base, across the middle and at apex, of which the basal is narrowest, but not linear, the others broad and all extending nearly, if not quite, across the elytra from side margin to side margin, the middle being the most irregular of the three in outline.

Under surface rufous.

Prosternal ridge narrowest at base, gradually broadening to apex, sides and apex distinctly margined, slightly convex basally with a few scattered punctures.

Mid-metasternum narrowly impressed each side at base of side margins; side margins fine and nearly reaching the suture of antecoxal piece.

Hind coxal plates with fine, not deeply impressed, punctures which are coarser towards the apices; apices separately rounded, but with the sutural angle very sharp, almost produced.

Abdominal segments with the usual rows of punctures very fine.

Male tarsi thickened, slightly pedunculate, and with the claws noticeably long for so small a species.

Male and female types from Taylor Co., Florida (W. S. Genung), in my collection.

Distinct from any other species on account of its small size and peculiar markings. About one hundred and fifty specimens examined show very little variation, and the largest is not larger than the smallest specimen of *lewisii*. I have seen other localities from which

I have specimens and Jacksonville, Florida (W. S. Genung), and South Carolina (Wm. Jülich).

Haliplus lewisii Cr.

Until the discovery of *annulatus* this was our smallest species. The average size, however, is considerably larger than the latter and while the maculation varies to quite an extent it does not approach that of *annulatus*. The punctuation is different, as are other structural characters, and the fine but distinct denticulation to the apices of the elytra is entirely lacking in the latter. The fact, stated by Mr. Matheson, that the species is found in Wisconsin and Indiana is interesting, as all the specimens noted heretofore are from Texas.

Haliplus borealis Lec.

Mr. C. G. Thomson has written that in *ruficollis* and its European allies the second joint of the labial palpi is dilated inwardly from base to apex so that the inner apical angle is prominent. *Borealis* has this same form of labial palpi, which at once places it in the *ruficollis* group, in spite of the lack of a thoracic plica.

Haliplus blanchardi new species.

Oval, shining, fulvous.

Size: length 3 mm.; width 2 mm.

Head very finely, closely, evenly punctured throughout; broad between the eyes, which are round, not large and rather prominent; antennæ ferruginous.

Pronotum with scattered fine punctures, not coarser than those of the head, immaculate, narrowly infuscate at apex and impressed at base; plica at each side of base fine, moderately long and not deeply impressed.

Elytra broadest just behind the humeri, gradually narrowing to the exterior apical angle which is prominent, nearly angulate; apices strongly sinuate; strial punctures small, not deep or closely placed, somewhat diminished apically; base broadly black from suture nearly to lateral margins, a small black spot below the humeri, a large patch of black below this on the suture, another spot obliquely below the patch and two more subapical spots, the interior of which is sometimes confluent with the suture.

Under surface testaceous.

Prosternum rather narrow at base, gradually narrowing to beyond front coxæ, but not constricted, thence widening somewhat to apex; sides margined and with rather coarse scattered punctures on the interspace, which is nearly flat; apex not margined.

Mid-metasternum with the margins short and somewhat thickened, or tumid, basally; moderately deeply impressed between the margins.

Hind coxæ with the punctures small, shallow, evenly placed, and with the apices rounded exteriorly and only very little incurved, nearly truncate, from apex to suture.

Abdominal segments, except the last, with the punctures almost obsolete.

Male front and middle tarsal joints distinctly thickened, but not pedunculate.

Male and female types from Fairfield Co., Conn. (Roberts), are in my collection.

Other localities for the species are South Framingham, Mass. (Frost); Staten Island, N. Y. (Roberts); Louisiana (Wm. Jülich), and Rhode Island. Named for the late Frederick Blanchard who showed me a specimen sent him by Mr. Frost, the first I had seen.

From the form of the labial palpi this species belongs in the *ruficollis* group and is closely allied to it and *longulus*, but at once distinct and easily separated by the strongly sinuate apices of the elytra, being nearer to *borealis* in that respect. It is not so elongate as *longulus*, resembling closely in form *ruficollis*, but is more shining and with the spots more confluent than in the latter.

Haliplus pallidus new species.

Oval, rounded, pale greenish yellow.

Size: length 3 mm.; width 2 mm.

Head finely, evenly punctate, immaculate; eyes round, well separated; antennæ color of head.

Pronotum finely punctured, except a narrow space across disc; punctures not larger than those of head, a narrow collar of slightly darker color across apex, a short rather deep plica at base each side.

Elytra broadest just behind the humeri, very gradually rounded, apices scarcely oblique; strial punctures small and shallow, not crowded, of a deeper shade than the ground color, except those of the 9th and 10th striæ, which are much finer, more or less confused and not darkened; immaculate, except that in some specimens small clusters of darker punctures give an indefinite suggestion of spots; a row of closely placed fine punctures on sutural interspace, other interspaces with the very fine punctures widely separated.

Under surface and legs color of upper.

Prosternum widest at base but not broad, gradually narrowing to front coxæ and continuing with the sides parallel to apex; narrowly channeled from base to apex, not distinctly punctate but having a roughened appearance.

Mid-metasternum depressed between the middle coxæ, margins very short, somewhat tumid basally.

Hind coxal plates finely, evenly, not deeply punctured; apices rounded exteriorly and very little incurved towards the suture where the angle is obtuse.

Abdominal segments with the rows of punctures very fine.

Male front and middle tarsi thickened, not pedunculate.

Male and female types from Corvallis, Oreg. (A. R. Woodcock), are in my collection. Other localities from which I have specimens are Laramie, Wyo. (H. F. Wickman); Frazer Valley, B. C. (R. Weidt); Arcata, Humboldt Co., Cal. (Dr. Van Dyke), and Garland, Colo. (U. S. Natl. Mus.).

Haliplus strigatus new species.

Oval, elongate, light fulvous.

Size: length 3–3½ mm.; width 1½–2 mm.

Head finely, sparsely punctured, broad between the eyes, infuscate at base, the infuscation in some specimens extending down below the apex of the eyes; eyes oblong oval, rather large and prominent.

Pronotum immaculate, light fulvous, sparsely, finely punctured even at base and apex, a broad space across the disc impunctate; basal plica deeply impressed, a little longer than one quarter the depth of the pronotum.

Elytra scarcely wider at humeri than at middle, sides nearly parallel, compressed; apices not strongly, but evidently, sinuate with the sutural angle acute; striæ composed of fine, deep, closely placed, blackened punctures; strigate; intervals, including the sutural, with the punctures obsolete.

Under surface and legs pale yellow.

Prosternal process flat, without margins, scarcely broader at base than between the front coxæ, beyond which it is strongly constricted and very little excurved to apex.

Mid-metasternum nearly flat, lightly impressed and finely punctured each side.

Hind coxal plates with the punctures modérate in size, well separated and very shallow; apices broadly, separately rounded.

Male front and middle tarsi thickened, evidently pedunculate, especially so on the middle tarsi.

Male and female types from Treesbank, Manitoba (J. B. Wallis), in my collection. Other localities from which I have seen specimens are Stony Mountain (J. B. Wallis) and Aweme (N. Criddle), Manitoba; Frazer Valley, B. C. (G. Weidt), and Laramie, Wyo. (H. F. Wickham). In a series from Aweme, Man., sent me by Mr. Norman Criddle, the specimens are a little larger and the characters of the under body somewhat exaggerated, but it is not otherwise distinct.

The six species, *borealis, ruficollis, blanchardi, pallidus, strigatus* and *longulus* form a distinct group by having the second joint of the labial palpi dilated inwardly from base to apex so that the inner apical angle is prominent, as pointed out in the case of *ruficollis* by

Mr. C. G. Thomson. All, with the exception of *borealis,* also have a thoracic fold, or plica, as a distinctive character.

While the species are all small and much alike in general appearance they should not be hard to separate. *Borealis* may at once be recognized by the lack of any plica on base of pronotum; *longulus* is the most elongate, noticeably so, narrow and highly polished and the thoracic plica is distinctly longer than in any of the other species; *strigatus* is distinguished by the lack of any maculation, the truly strigate elytra, caused by the deep, blackened, closely placed punctures, with their compressed, almost parallel sides.

Ruficollis, blanchardi and *pallidus* are proportionately stouter than the others, and of these three *blanchardi* may be recognized by the strong sinuation of the apices of the elytra and acute exterior angle, which characters are fully as pronounced as in *borealis; pallidus* by the lack of any *black* markings, even on the base of the elytra, and the flat prosternal process; *ruficollis* by its black maculation, usually distinct, apices of elytra rounded, prosternal process depressed, or channelled, lengthwise. In the hundreds of specimens of *ruficollis* examined I have never seen a specimen, even when the usual maculation has almost completely disappeared, that did not have at least a narrow black basal margin. If doubt exists after separating by these general characteristics a reference to the full descriptions should at once dispel it.

PELTODYTES Regimbart.

It is with a strong feeling of rebellion in my heart that I adopt the generic name *Peltodytes* of Regimbart for that of the well-known and long-established *Cnemidotus* of Erichson. However, Illiger having undoubtedly made this name a synonym of the *Haliplus* of Latreille it could not be used, under the accepted rules, and we lose one more name long familiar to all students and collectors of aquatic Coleoptera.

Peltodytes callosus Leconte.

In addition to characters mentioned by other writers I find that in this species the mid-metasternum is deeply depressed between the middle coxæ so as to leave the margins at base decidedly tumid, while behind the coxæ they are fine, but quite distinct, and nearly

reach the suture of the antecoxal piece; the space between the margins is impunctate and shining. The posterior coxal plates are broadly, separately rounded, without any appearance of angulation, and with the punctures large but very shallow and indistinct. The apices of the elytra are not rounded, as stated by Mr. Matheson, but obliquely truncate and evidently sinuate.

The males may be separated from the females by the thickening of the joints of the front and middle tarsi, especially the first and second joints of those of the middle legs.

It is probably pretty well known that the females have the elytra tuberculate as well as the males and are not, as supposed by Mr. Crotch, "very hard to separate from *12-punctatus*."

The species has quite a range of habitat and I have specimens from Provo (H. Soltau), Virgin River (G. Weidt), and Mill Creek (Hub. & Sz), Utah; Tacoma, Wash.; Corvallis, Oreg. (A. R. Woodcock); Peachland (J. B. Wallis), and Frazer Valley (A. Weidt), Brit. Col.; Alburquerque, N. Mex. (H. F. Wickham), and from nearly all parts of California.

Peltodytes simplex Leconte.

In this species the mid-metasternum is not deeply impressed between the middle coxæ, as is the case in *callosus*, but nearly flat, lightly impressed each side behind the coxæ and with the margins short, hardly reaching half way to the margin of antecoxal piece, smooth and shining between the margins with a few deep punctures at their extremities. The hind coxal plates are rather more deeply punctate than in *callosus* and the apices are subangulate.

Last abdominal segment smooth and shining.

The under plane of the body is rather flat, not strongly arched longitudinally at the mid-metasternum, or "chicken-breasted," as in *edentulus* and some other species.

I should not call the prosternal process "steeply declivous in front," but strongly arched almost from base to gula without distinct apex or limiting margin. The thighs of posterior legs are dark brown in color, and the males have the joints of the front and middle tarsi thickened, but not pedunculate. All the specimens I have seen are from San Diego, Los Angeles, Campo and San Bernardino, California.

Peltodytes dispersus new species.

Oval, elongate, greenish yellow.

Size: length 3¼–3¾ mm.; width 2–2½ mm.

Head finely, evenly punctured, narrow between the eyes; eyes large, oval, not strongly convex; antennæ color of head.

Pronotum evenly punctured, except a small space at disc, those of the apex and sides less coarse and deep than those at base; punctures not blackened; and the usual black basal spots moderate in size.

Elytra broadest at middle, gradually rounded from base to exterior apical angle; apices truncate-sinuate with the sutural angle acute; striate with eleven rows of coarse, deep, blackened punctures diminishing, but not confused, apically, with a short basal stria between the third and fourth; the fourth stria is rather crowded, in some specimens, between the third and fifth but distinct, and the eleventh is placed close to the lateral margin; maculate with six small, rather faint, black spots of which the first three form a triangle which has the apical spot placed at the base of the short extra stria and the other two subsutural and sublateral at the median line, with the second three forming a smaller subapical triangle; suture narrowly black and the base with a very narrow dark border and a row of large, deep punctures extending from suture to humerus.

Under side and legs ferruginous in color.

Prosternal process broad at base, finely but distinctly margined laterally, shallowly concave or channeled, rapidly narrowed to front coxæ where it is strongly constricted, and thence widening a little to apex; apex defined by a fine outwardly convex margin; rugosely punctured between the margins.

Mid-metasternum not strongly depressed between the middle coxæ, slightly impressed each side below them, margins fine and short, intermediate space shining and with a few scattered punctures near the margins.

Hind coxal plates finely, evenly and not deeply punctured; apices rounded and faintly subangulate at middle with the sutural angle rectangular.

Last abdominal segment smooth, shining; hind femora very dark brown.

Male front and middle tarsi with the joints very little thickened, not at all produced.

Male and female types from Tucson, Arizona (Geo. D. Hulst), are in my collection.

Other specimens before me are from Prescott (Hulst), Riverside (H. F. Wickham), Huachuca Mts. (H. G. Barber), Hot Springs, Brt. Angel, Col. Canyon (H. S. Barber), and other localities in Arizona; Provo, Utah (H. Soltau).

The species is nearest to *simplex*, but at once distinct by its lighter color, more narrow form, much finer punctuation, the complete fourth stria and the narrower prosternal process with its evident apical margin.

Peltodytes muticus Lec.

According to my view this species, and all our other species of *Peltodytes,* has eleven, not ten, striæ on each elytron.

I do not know why the fourth stria should be left out of the count because it is interrupted, any more than the tenth, or eleventh as I count, because it is placed so close to the lateral margin as to actually crowd upon it, as is not infrequently the case.

This interruption of the fourth stria has apparently been caused by the strong sinuation, or incurving, of the fifth stria and I have specimens, in *muticus* for example, in which the fifth stria is not so strongly sinuate as usual and here the fourth is complete, with no punctures missing from the fifth.

As I count them we have a genus composed of species with the elytra eleven striate, not one composed of species with the elytra with either nine, ten or eleven striæ, with parts of striæ, or extra striæ, to be accounted for. *Muticus* should not be hard to recognize, and is quite distinct from *floridensis oppositus* and *shermani* which are mixed with it in some collections. The punctures of the striæ on the basal half of the elytra are strikingly coarse and deep, while those of the lower half become smaller and smaller and much confused as they approach the apex.

The apices are not rounded, but truncate, slightly oblique and feebly sinuate. The six spots on the elytra represent two triangles in the upper of which the apical spot is weak, the lateral distinct and the inner large and coalescent on the suture submedianly forming an irregular patch, while in the lower, subapical triangle the spots are small and more or less indistinct, but not coalescent.

There is no subhumeral spot and the suture is very narrowly margined with black except where it expands to coalesce with the submedian spot.

It is not strongly arched, or "chicken-breasted," underneath the body.

The mid-metasternum is nearly flat, very lightly impressed each side, with the margins fine, arcuate and nearly reaching suture of antecoxal piece.

Hind coxal plates with small evenly placed punctures, rounded behind and showing scarcely a trace of angulation.

Last abdominal segment smooth, shining. Posterior thighs dark brown, nearly black at the knees.

Male front and middle tarsal joints feebly thickened.

The subhumeral black patch on the suture of elytra, with the other markings weak, is quite distinctive.

Peltodytes oppositus new species.

Oval, fulvous, shining, spots distinct.

Size: length 3½–4 mm.; width 2–2¾ mm.

Head finely punctured, narrow between the eyes, vertex smooth; antennæ color of head.

Pronotum evenly, rather finely punctured, more sparsely between the basal spots, with a few coarse punctures on the spots and along the base towards the side margins.

Elytra broadest near the middle, gradually rounded, apices obliquely truncate and sinuate; striæ composed of mixed punctures, those of the inner three, and interrupted fourth, being much smaller and less deeply impressed than those of the middle and lateral rows; the punctures diminish in size below the median line but the rows are not confused; the maculation consists of seven large, distinct spots, one humeral, one sub-basal, two median the outer of which is sub-lateral and the inner coalescent with the sutural margin, three subapical in a triangle and not confluent; black basal margin narrow except just below the spots on pronotum, where it extends downwards somewhat upon the elytra; the suture is broadly margined with black, reaching the first stria, from base to coalescent median spot and from thence much more narrowly to the blackened apex.

Under side bright fulvous.

Prosternum broadest at base, narrowing gradually to front coxæ and only a little widened at apex; sides rather thickly, and apex finely margined, not channeled but rather full between the margins and closely, evenly punctured.

Mid-metasternum nearly flat, margined, lightly impressed each side below the coxæ, evenly, finely punctured between the margins except a limited central spot; the margins are weakly arcuate at the coxæ and extend about two thirds the distance to the antecoxal piece.

Hind coxæ evenly, finely punctured; apices distinctly angulate; posterior thighs very dark brown, nearly black, and the last abdominal segment dull, distinctly rugose.

Male front and middle tarsi with the joints thickened, slightly produced.

Male and female types from Jacksonville, Florida (W. S. Genung), in my collection. Although somewhat similar in markings to the *floridensis* of Matheson, and taken with it by Mr. Genung, I believe this species to be distinct. A special characteristic of *floridensis* is the brevity of the rows of coarse punctures on the elytra

which are replaced at, or just behind, the middle by more confused rows of fine punctures. In the present species they are normal, the series of coarse punctures extending farther back. Furthermore the anal segment is distinctly rugose and dull instead of shining; the spots distinct, not confluent, and consequently decidedly more of the ground color appears. The prosternal process is broader at base and the punctures finer and more extended on both it and the meta-sternum.

In many respects it is the opposite of *floridensis*.

Peltodytes shermani new species.

Oval, testaceous, spots large and distinct.

Size: length 3½–4 mm.; width 2¼–2½ mm.

Head very finely, closely, not deeply punctate; punctures stronger between the eyes than on vertex; narrow between the eyes; eyes large, round, prominent; antennæ somewhat darker than head.

Pronotum with the punctures small, evenly distributed, slightly larger basally; basal black spots moderate in size.

Elytra slightly wider at middle than at the shoulders, very gradually narrowed to the exterior apical angle; apices nearly truncate, feebly oblique and sinuate, with the exterior angle evident and the interior rectangular; the eleven striæ, of which the fourth is broken antemedianly, are composed of moderately coarse punctures not greatly reduced in size until near the apex, not confused; maculate with seven large black spots placed as follows: one subhumeral laterally, one antemedian on the fourth stria, two below this one sublateral and median, the latter touching the blackened suture, three below these two, subapical, forming a small triangle; base and suture margined with black, the former narrowly and the latter broadly from base to median spots and then narrowly to the usual black apex.

Under side light testaceous; legs light testaceous with the joints and entire posterior femora black.

Prosternal process moderately broad at base, gradually narrowing to front coxæ, where they are feebly constricted, and thence only slightly broadening to apex; apex and sides distinctly, though not thickly, margined, evenly, confluently punctured between the margins.

Mid-metasternum broad between the margins, nearly flat, confluently punctured at base and sides, not impressed; margins distinct, quite strongly arched at the middle coxæ, parallel below them and reaching two thirds the distance to the suture of antecoxal piece.

Hind coxal plates evenly, finely, shallowly punctured, apices broadly rounded with scarcely a trace of angulation.

Last abdominal segment somewhat shining, finely rugose on apical half.

Male with the joints of the front tarsi very little modified, but the middle tarsi have the first and second joints remarkably produced with the third joint simple.

Male and female types from Staten Island, N. Y. (Roberts), in my collection.

Other localities from which I have seen specimens are Cambridge (U. S. National Mus.) and Tyngsboro (F. Blanchard), Mass.; Fairfield Co., Conn. (Roberts); Camden Co., N. J., and Washington, D. C.

Named for my very good friend and enthusiastic co-worker in the Dytiscidæ, Mr. John D. Sherman, Jr.

The presence of the subhumeral spot at once separates this species from *muticus*, and the remarkable production of the joints of the middle tarsi in the male distinguishes it from any of those species having the posterior femora black or unicolorous.

Peltodytes sexmaculatus n. sp.

Oval, greenish yellow, spots round, well separated.

Size: length 3½ mm.; width 2½ mm.

Head narrow between the eyes; eyes large, round, prominent; antennæ pale yellow; finely, evenly punctured with the punctures slightly finer on vertex.

Pronotum finely, evenly punctured except a small discal space impunctate; punctures scarcely larger than those of the head with a few coarser ones placed in the small black basal spots.

Elytra elongate oval, eleven striate, with the fourth stria interrupted antemedianly; apices, viewed from above, subsulcate the exterior angle being quite sharp and slightly produced with the interior rectangular; striæ composed of coarse punctures, blackened, except those of the 10th and 11th striæ, gradually reduced in size towards the apex, but not confused; maculate with six round spots on each elytron, moderate in size and placed as follows: one antemedian, two below this one at about the median line, the exterior sublateral and the interior subsutural, three below these forming a small triangle; base and suture narrowly margined with black, from suture to humerus and from base to apex.

Under side color of upper.

Prosternal process broadest at base, strongly constricted just beyond the front coxæ, very little broader at apex than at point of constriction, margined at the sides and apex, the side margin basally being somewhat thickened; confluently punctured and wrinkled between the margins.

Mid-metasternum margined, slightly impressed along the margins interiorly, margins nearly parallel and somewhat thickened between the middle coxæ, confluently punctured at base and with a few fine punctures near the margins.

Hind coxal wings with small, evenly placed, not deep punctures; apices evidently subangulate.

Posterior leg with the femora dark brown basally, deepening to almost black apically, and with the apex of tibia black.

Last abdominal segment shining, very finely rugose.

Male front and middle tarsi with the first and second joints slightly thickened and feebly produced.

Male and female types from Covington, La. (George Coverdale), are in my collection.

Other localities from which I have seen specimens are Galena, Kansas (E. Crumb); Brownsville, Tex. (H. F. Wickham); Missouri, Texas and Mass. (U. S. Natl. Mus.).

Looking at this species superficially it may be separated from the other species with dark or black hind femora by the maculation. It has no median black patch on the suture, as does *muticus*, and is separated from *floridensis, shermani* and *pedunculatus* by the lack of any subhumeral spot and the narrow, black sutural margin, occupying only half the space between the suture and first stria, and not wider basally than apically or touching the median spot.

Peltodytes tortulosus new species.

Broadly oval, greenish yellow, hump-backed.

Size: length 4½–5 mm.; width 2¾–3¼ mm.

Head broad between the eyes, finely, evenly punctured, a smooth space before vertex, vertex more or less infuscate: eyes round, not large, prominent; antennæ light yellow.

Pronotum evenly, not closely punctured with small punctures on the apical half and sides, a few coarser ones on the base and in the rather large basal black spots; a deep impression across the base between the spots.

Elytra broadest at the shoulders, feebly narrowed to the exterior apical angle, strongly arched medianly and flattened basally so as to appear hump-backed; apices feebly sinuate-truncate with the angles broadly rounded; eleven striate, the fourth stria not interrupted; punctures of the striæ coarse basally, much reduced in size below the median line, confused apically by the interposition of fine punctures; punctures very black, closely placed, not infrequently confluent or irregularly placed; suture very narrowly black, a row of deep confluent punctures along the base from the suture arching down upon the fifth stria; no subhumeral spot and the usual six spots indistinct or illy defined.

Under side fulvous, strongly arched at the mid-metasternum, or "chicken-breasted."

Prosternal process narrow at base, quite strongly constricted just beyond the front coxæ, gradually widening to apex, which is about two thirds the width of base; sides and apex finely margined, flat basally and concave at and beyond the point of constriction; not closely punctured.

Mid-metasternum slightly tumid each side at base, impressed each side behind the middle coxæ, finely margined for half the distance to the antecoxal

piece; interspace smooth, shining with a few punctures at base and below the margins.

Hind coxal plates with small, evenly placed, not deep punctures; apices rounded, feebly subangulate when viewed from the side.

Posterior legs with the thighs pale, color of under side, with the knees, and apex of tibia, darker.

Last abdominal segment shining, very finely rugose.

Male with the tarsi of front and middle legs thickened, but not produced.

Male and female types from Winnipeg Beach, Manitoba (J. B. Wallis), are in my collection. Also taken by Mr. N. Criddle at Aweme, Man. Our largest species and at a glance distinct from any other so far known.

The very black, closely placed punctures give it a very dark appearance.

Its form places it near the *callosus* of Leconte.

Peltodytes lengi new species.

Oblong oval, greenish yellow, spots moderate in size.

Size: length 4 mm.; width 2½ mm.

Head narrow and finely punctate between the eyes, vertex broadly impunctate; eyes large, broadly oval; antennæ color of head.

Pronotum finely, closely punctured apically, more coarsely and sparsely basally and at the sides; basal spots large and coarsely punctured.

Elytra broadest at shoulders, gradually narrowing to the exterior apical angle; apices feebly sulcate; eleven striate with the fourth greatly interrupted; punctures of striæ coarse and deep, those of the first and second smaller, rows distinct to near apex where there are three or four rows of small punctures placed horizontally, punctures blackened; maculate with six spots moderate in size and forming the usual two triangles with the median spot entirely free from the narrow black suture; base narrowly black to the humerus, with no evidence of a subhumeral spot or black dash.

Under side and legs yellow.

Prosternal process broad at base, strongly constricted between the anterior coxæ; apex half as broad as at base; sides and apex margined, margin thickened on basal half, somewhat convex between the margins and confluently punctured.

Mid-metasternum arched, broad, margined; margins somewhat thickened, or tumid, at the middle coxæ and a little convergent behind, extending more than half way to the suture of antecoxal piece; a few fine punctures between the margins.

Posterior coxal plates with numerous small, shallow punctures; apices feebly subangulate.

Posterior femora black basally and at the knees with a broad yellow band between.

Last abdominal segment smooth, polished.

Male front and middle tarsi with the joints thickened, the first and second being feebly produced.

Male and female types, from Staten Island, N. Y., are in my collection.

Named for my friend and associate of many years, Mr. Charles W. Leng, who was acting as my guide to the haunts of *Bidessus flavicollis* when the fourteen specimens before me were taken. In addition to the above I have seen a single specimen, taken at Chambersburg, Pa., by Mr. J. D. Sherman, Jr. The species is distinct from *12-punctatus* by its coarser elytral punctuation, the lack of any subhumeral spot, or dash of black, the scarcely subangulate apices of the coxal plates, which are distinctly angulate, or produced, in *12-punctatus*, and the much broader yellow band on the hind femora. From *edentulus* it is at once separated by the lack of a black collar on vertex of head and the structure of the under side of the body, as well as coloration.

These two are the only other species known with yellow-banded hind femora.

Peltodytes pedunculatus Blatchley.

I have never seen authentic specimens of this species and the author gives little else than maculation, as compared with *muticus*, to define it.

Specimens of a species from Covington, La. (Mr. Coverdale), separated by me as *pedunculatus*, have the sutural margin broad before the median spot, occupying the whole of the sutural interval, and narrow below it. While the median spot may not perhaps be called coalescent with the sutural border it touches the margin, and there is a subhumeral spot.

The apices of the elytra are feebly sinuate and slightly oblique. The apices of hind coxal plates are subangulate and the last abdominal segment smooth and shining. The posterior femora is very dark brown. The prosternal process is feebly sulcate, not greatly constricted.

The species is distinct from *shermani*, which is the *pedunculatus* of my manuscript referred to by Mr. Blatchley, and also from *muticus* and *sexmaculatus*.

From Mr. Blatchley's definition of his species in his table I am

inclined to think he had two species before him in making his synopsis of characteristics, perhaps *sexmaculatus* and his own. A single specimen each from "Kansas" and Detroit, Mich., in the U. S. Natl. Mus. collections, agree with the above-described specimens from Covington, La.

Peltodytes littoralis Matheson.

A very distinct species and easily separated from any other of our species by the uniformly pale posterior femora, its light yellow color and small but distinct spots on the elytra. The basal spots on the pronotum are very small and do not touch the base in any of the specimens I have seen.

A dozen specimens are before me from Kansas and Texas.

Peltodytes festivus Wehnke.

This pretty little species is represented in the U. S. Natl. Museum Collections. A careful examination shows the fourth stria to be very broadly interrupted and the lateral one placed almost upon the margin. They are no more broadly interrupted, or closer to the margin, than in some of our other species and, counting them, the species has eleven striæ instead of nine, as described by Mr. Wehnke.

Peltodytes duodecempunctatus Say.

In this species, as recognized by Aubé, Leconte and Crotch, the fourth elytral stria is very greatly interrupted. The strial punctures of the elytra are coarse, except those of the first and second, and very much diminished from about the median line to the apices. The apices are sulcate, though not strongly so. The maculation consists of six spots, placed as usual, and there is a black subhumeral dash almost upon the lateral margin. This dash of black is usually quite distinct, but I have seen specimens where it is represented by two or three very deeply blackened punctures only. The suture is narrowly margined with black and the median spot free. I have seen a few specimens in which the black sutural border broadens out somewhat towards the base, with the median spot barely touching it. The margins of the prosternal process are rather thick, both lateral and apical, and the constriction strong. The mid-metasternum has the margins thick and short, not reaching more than half way to the antecoxal piece, arched between the middle coxæ and somewhat con-

vergent apically. The apices of the posterior coxal wings are strongly angulate, more so than in *edentulus*, and the hind femora ringed with yellow before the knees. The joints of the front and middle tarsi in the males are very little modified, yet sufficiently so to at once separate them from the females.

Peltodytes edentulus Leconte.

This species is so well known by the black collar on the base of head that comment is scarcely necessary. I may state, however, that the species has no subhumeral spot, or dash of black; that the apices of elytra are decidedly sulcate, more so than in *12-punctatus*, and while the apices of the hind coxal plates are evidently angulate they are not so strongly so as in the above. It is one of the three species with the yellow band before the knees on the posterior femora.

The tarsal joints of the front and middle legs are thickened and slightly produced at apices in the males.

I have seen specimens with the head so much retracted as to completely conceal the black collar and, for the moment, disconcert one.

I have specimens from as far north as Treesbank and Winnipeg, Manitoba, collected by Mr. J. B. Wallis.

While I have indicated groups into which the species of *Haliplus* more or less naturally fall, and have given comparative characters by which to separate those in the different groups, I have not undertaken to make a table as I have not recognized three of Mr. Matheson's species.

A table of the species of *Peltodytes* follows.

	Posterior femora entirely black or brown	1.
	Posterior femora black, ringed with yellow before the knees	2.
	Posterior femora pale, knees only darker	3.
1.	Elytra without subhumeral spot, or dash of black	4.
	Elytra with a subhumeral spot, or dash of black	5.
4.	Elytra without distinct callosity, or tubercle	6.
	Elytra with a distinct callosity	*callosus.*
6.	Apex of prosternal process distinctly margined	7.
	Apex of prosternal process not distinctly margined	*simplex.*
7.	Fourth stria incomplete, interrupted medianly	8.
	Fourth stria complete	*dispersus.*
8.	Median spots coalescent on suture forming a black blotch	*muticus.*
	Median spots free, not coalescent on suture	*sexmaculatus.*
5.	Sutural margin uneven, noticeably wider basally than apically	9.
	Sutural margin even, not wider basally than apically	*festivus.*

9. Last abdominal segment shining, polished .... 10.
Last abdominal segment dull, rugose .... 11.
10. Spots smaller, distinct, median barely touching sutural margin *pedunculatus.*
Spots larger, confluent, median distinctly coalescent with the sutural margin .... *floridensis.*
11. Posterior coxal plates rounded at apex, scarcely perceptibly angulate; 1st and 2d joints of middle tarsi in male strongly produced *shermani.*
Posterior coxal plates angulate; 1st and 2d joints of middle tarsi in male thickened, but scarcely produced .... *oppositus.*
2. Elytra without subhumeral spot or dash of black .... 12.
Elytra with a more or less distinct spot or dash of black, hind coxal plates distinctly angulate at apex, produced ....*duodecempunctatus.*
12. Base of head with black collar, apices of posterior coxal plates angulate *edentulus.*
Base of head without black collar, apices of posterior coxal plates rounded .... *lengi.*
3. Species smaller, bright, spots distinct, apices of posterior coxal plates subangulate .... *littoralis.*
Species larger, dark, spots indistinct, hump-backed, apices of posterior coxal plates rounded .... *tortulosus.*

THE PASSING OF THE HICKORY NUT?[1]

BY HENRY BIRD,

RYE, N. Y.

I want to depart from my usual theme on this occasion and call your attention to a coleopterous matter. I wish to say a word relating to *Scolytus quadrispinosus.*

Along about Columbus-Davis day, in other words October 12, or thereabouts, I begin to be fond of sitting by the open grate fire, cracking hickory nuts, and planning campaigns for the next year. But my pleasures of late have been marred by the lack of hickory nuts, and in so far as the supply is local, it would seem the time is near when we can say goodby to the hickories altogether. The weevil that attacks the nut I have always classed a despicable varmint, and have enjoyed sizzling many of them, but we are confronted of late years by another trouble, more important since it spells the death of the trees.

[1] Read before the New York Entomological Society, December 3, 1912.

I refer to the work of the hickory bark borer, *Scolytus quadrispinosus* Say, with which you are all familiar. It takes two years as a rule for the work of this beetle to cause the complete death of a mature tree, but when a tree is fairly infested there seems little hope for it. The economic bureaus have been considering the matter for some time but the remedy suggested, so far as I have learned, is for a rather idealistic treatment that at present cannot avail, at least in my locality. As you are doubtless aware the larvæ of *quadrispinosus* pass the winter in their galleries beneath the bark and do not hatch out till the last of June. At the time of their emergence the beetles bore their way out to the surface, producing the shot-hole effect so characteristic of their work. At this time, however, the damage is done, the girdling effect of the larvæ in working across the bast fibers that carry the sap is finished and the portion of the tree above the infestation is in a dying condition. The remedy advocated by the bureaus, and a natural one, is the cutting down and burning of infested trees during the winter and spring, thus exterminating the larval supply. Excellent, if it were nearer the millennium such suggestions might be all right, and if it were the inception of an introduced species such a course would be the only thing to consider. But we have to do with an indigenous species, a very general and widespread infestation, and there are no laws compelling people to cut their trees down, were they expert enough to do so at a proper time. At the first when a tree is chosen by the female beetles as being in a proper state for ovipositing, it takes an expert indeed to know that soon there will be thousands of young larvæ working under the bark and that ultimately, in the coming June or earlier, the tree will show signs of impending doom. Before the emergence holes are seen there is no clue to guide the uninitiated, and after the beetles have gone out there is no use in felling the tree. Even did a confiding public stand ready to follow every direction, they could hardly tell what trees to destroy. To the average person who must judge from the foliage appearance of his trees which ones he must cut down, the period of efficiency, when the larvæ could be destroyed, is very brief.

A healthy tree in August has its bark infested with numerous egg cells. No indication is evidenced in the foliage up to the time the leaves fall, and the buds seem healthy during the winter. Hickories are late in starting and it is well in May before the trouble is mani-

fested with certainty. Even then only the upper portions may be involved, and any one would naturally hesitate to take out such a tree. But it is in this short time from May first to the middle of June that the evidence must be weighed and the removal made, if such operation is to be of any avail at all.

In my little burg of Rye, the four and a half square miles under incorporation contain many hundred trees dead and dying from these attacks, but nothing short of an earthquake could get the thirty-five hundred property holders to act in sufficient unison in destroying the larvæ at a proper time, when what would seem a sacrifice of their own trees was for the general good of mankind, and for their neighbor in particular.

I think we must look in another direction and confine saving treatment to parks, lawns, and preserves where the owner is willing to incur some expense, and the management is under competent supervision. There are other ways to save a few of the hickories, I am very sure.

Briefly reviewing the life history we find the beetles coming forth from the last of June to the middle of July; they do not mate at once but flock around the trees, or fly to new territory. They are on the wing, so to speak, all through July and take some sustenance apparently in chewing into the bases of the leaf petiole. Here they mine a little cavity, large enough to crawl in, and this work subsequently causes the leaf to fall. They often mate in these borings, but it is not till well in August that the females are in condition to place their eggs. This they do by chewing a hole through the bark to the sapwood, of the trunk and larger branches, beginning at, and including usually the upper third of the tree. The boring is enlarged underneath the bark, in this cell the eggs are placed, and in a few weeks the larvæ hatch out. This brings us to the middle of September. Up to the time the larvæ hatch no harm is done, but whatever we do by way of prevention must be effective by that date.

Two methods of treatment are suggested, one, where a repellent is used at the time the beetles oviposit, some ill-smelling spray like whale-oil soap which will cause them to shun the tree; the second, and probably safer method, is to treat the little holes leading to the egg cells with something that will fix the eggs and yet not injure the tree. The latter is not quite the task it might seem since the females

oviposit only in the trunk and out on the branches till they get down to, say, one inch and a half in diameter. I know of trees forty feet high, punctured by between two and three hundred females for their egg cells, that were thoroughly treated in three hours, with no more elaborate outfit than a small squirt-can oiler, and a quart of gasolene. Both schemes worked all right in so far as they have been tried, and up to this date no injury has resulted from using the gasolene. So, in the case of valuable trees a repellant can be tried, and if ineffectual, it can be followed up with a treatment of the egg cells.

In selecting the trees that suit them the beetles choose those of weakened vitality, their sense in this direction being very keen. It would be hard to say why a certain tree here, and one there, is chosen, but this feature is at once obvious to one following up their work.

I am led to offer these remarks since many in charge of valuable plantings have thrown up their hands in dismay over a simple matter like this. Were they confronted by some of the real propositions in boredom, I won't say whether they are among the lepidopters, or not, there might be some excuse for despair.

THE NORTH AMERICAN SPECIES OF LISPA (DIPTERA; ANTHOMYIDÆ).[1]

By J. M. Aldrich,

Moscow, Idaho.

While the Anthomyidæ in general have justly acquired the reputation of being very difficult to classify, and at the same time highly uninteresting, there are a few groups that are not only easily recognized, but also of considerable scientific interest. If these were better known, it might take the curse off the family; fuller knowledge would inevitably create more interest, and with a few entomologists the family might become even a favorite. Hence it is very desirable that such genera as are susceptible of easy definition be worked out, as a beginning.

[1] This paper is one of the results of an investigation of western salt and alkaline lakes, carried on with the aid of an appropriation from the Elizabeth Thompson Fund.

The genus *Lispa* is one of these easily recognized ones. It belongs to the second section of the family, having the front broad in the male as well as in the female, and in this section differing from all its congeners in having in both sexes great dilated palpi, generally somewhat spoon-shaped, and either black or yellow in color. The species are found at the edge of water, and occur in abundance throughout the season everywhere in the United States; two or three species can be found in any neighborhood. Nothing definite is known about the larval habits, but by elimination it would appear that they must occur in the mud in the immediate vicinity of the adults. The commonest species are about the size, shape and color of a house-fly.

The known North American species agree closely in most of their characters, which are given below at some length to avoid repetition in the specific descriptions.

Generic Characters.—Front broad in both sexes, with a row of about 6 orbital bristles, the upper two curving backward or nearly erect, the rest curving toward the middle line; orbits hairy between the eye and these bristles; no hairs or bristles on the front between the ocelli and the antennæ; a large pair of ocellar bristles and numerous hairs between and behind the ocelli. Antennæ not very long, arista thickened at base, plumose. Face concave, epistoma projecting, with large vibrissæ and some smaller bristles, which continue back along the sides of the mouth cavity (in *palposa* the males and some females without vibrissæ, or these indistinguishable from the other bristles); facial orbits with small hairs, which in some species are continuous with those of the frontal orbits; head somewhat protuberant at the insertion of the antennæ, often with a contrasting black velvety transverse band turned up at the ends, across the base of the antennæ. Palpi greatly dilated at tip, either suddenly or gradually, more or less bare and glistening on the expanded portion. Proboscis short, small, horny, labella of medium size. Back of head protuberant, hairy; vertical bristles 2 pairs as usual; one pair of small post-verticals, occiput bare.

Thorax somewhat narrow and elongate, with the following chætotaxy: dorsocentrals 5, 3 behind the suture (*nasoni* has 6, 4 behind the suture); acrostichal merely hairs; notopleural 2; presutural 1; posthumeral (intrahumeral) 1; humeral 2 or more; supra-alar 1; intra-alar 2; postalar 2; scutellar 2 (pairs); prothoracic (above the front

coxæ) 1 or more; mesopleural 1 in front near the protothoracic and a vertical row on hind edge; sternopleural 3 (1 in front and 2 behind). Calypters (tegulæ, squamæ) rather large, conspicuous, the hind one about twice as long as the other. Abdomen cylindrical, straight or convex, or moderately depressed, often with spots of yellow or white pollen on the last two segments; segments hairy, the hairs longer on the hind edge of the segment and especially on the sides, on the fourth and fifth these long hairs becoming bristle-like; hypopygium never very large. Legs hairy and bristly; the principal bristles of the front ones as follows; coxæ on fore side with numerous bristles not in rows except on outer edge; femora with a double row on upper and outer edge, and a single row on lower and outer edge; tibiæ with about three preapical bristles and sometimes one higher up, below the middle. Middle legs: coxæ hairy or bristly on foreside, femora sometimes elongate and then more slender on apical third, with one or more preapical bristles on the hind side above; tibiæ with one or two bristles on the outer side about the middle. Hind legs: femora with a row of bristles above, and another less complete on the lower and outer side; tibiæ with one or two bristles near the middle and several preapical.

Wings of simple structure, third and fourth veins parallel (convergent in some old-world species); no noticeable spots or clouds; anterior crossvein almost behind the tip of first vein; posterior crossvein distant less than its length from the margin (on the fifth vein).

The first comprehensive treatment of the North American species was by Stein, in his important paper on N. A. Anthomyidæ (Berl. Ent. Zeitsch., XLII, 161–288, 1897); he described three new species (*nigromaculata* subsequently proving to be a synonym of *palposa*), and identified three others. Starting from this basis, the student may consult two important papers on the European and palæarctic fauna respectively;—Kowarz, Wien. Ent. Ztg., XI, 33–54, 1892; and Becker, Zeitsch. f. Ent., XXIX, 1–70, 1904.

My study of the North American species indicates that the available characters for specific separation are few but sufficient. Head characters are the width of the front at the narrowest as compared with the entire width of the head, the measurement being in both cases at the level of the antennæ or even a trifle below, where the compound eyes are nearest together. The presence and coarseness of hairs on the sides of the face; presence of a black band across root

of antennæ; presence and size of the vibrissæ; and the shape, size and color of the palpi, are characters of importance. In the thorax and wings few specific variations occur in North American species, at least of a tangible kind. The legs are quite rich in characters when closely studied; three of the species show secondary sexual characters here, only one of which was known heretofore. The length of the hind tarsi of the males in comparison with their tibiæ is generally important, and the number and arrangement of the spines on the under side of the hind femora are very useful. The abdomen differs in form from cylindrical to depressed, and is variously marked with gray or white pollen. I have made no particular use of the hypopygium, although I do not doubt that it has a variety ot forms quite distinctive when it is extirpated so as to be available for study, in the method of Schnabl and Dziedzicki.

The following table summarizes the data I collected from measurements of the species. The columns contain the following data:

Column 1, the quotient obtained by dividing the entire horizontal transverse diameter of the head by the distance separating the eyes at the point of greatest approximation (about the level of the antennæ), in the male sex.

Column 2, the same for the female sex.

Column 3, the quotient obtained by dividing the length of the hind tibia by the length of the hind tarsus, in the male sex.

Species.	1	2	3
albitarsis	3.85	2.74	.94
antennata	2.06	1.92	.98
brevipes	2.90	—	1.47
johnsoni	3.71[1]	2.21	1.64
nasoni	3.10	2.51	1.06
palposa	2.62	2.50	1.37
patellata	2.70	—	1.08
polita	2.62	2.33	1.04
salina	2.44	2.06	1.00
spinipes	3.22	3.02	1.70
sociabilis	2.86	2.50	1.27
sordida	3.21	2.42	1.39
tentaculata	2.89	2.33	1.03
uliginosa	2.80	2.47	.98

[1] The only male of *johnsoni* is teneral, the head somewhat shrunken, and this number is undoubtedly too large.

The following figures will give an idea of the degree of constancy of the characters:

Five males of *salina* gave the following numbers for column 1—2.39, 2.45, 2.44, 2.42, 2.50. Average, 2.44; range, .11.

Eight males of *tentaculata* gave 3.00, 2.95, 2.76, 2.77, 2.72, 2.70, 2.74, 2.89. Average 2.82; range, .30.

Four males of *uliginosa* gave 2.77, 2.72, 2.89, 2.83. Average, 2.80; range, .17.

Four females of *nasoni* gave the following for column 2—2.40, 2.58, 2.50, 2.54. Average, 2.51; range, .18.

Three females of *tentaculata* gave 2.33, 2.34, 2.33. Average, 2.33; range, .01.

Four females of *salina* gave 2.00, 2.11, 2.06, 2.41. The last showed the character of the male in the front, and I re-examined it carefully. It was the only case of the kind that occurred, and as it appeared abnormal I excluded it from the average, which would then be 2.06, with a range of .11.

The following species mentioned in my Catalogue are not included herein; for the reasons given:

consanguinea. The dark tibiæ are not decisive, as made out by Stein, and there is no evidence that the species as now accepted occurs in North America.

flavicincta. Not seen by Stein, and probably not North American.

hispida. Unrecognizable, and type not found by Stein in the British Museum.

nigromaculata. A synonym of *palposa,* but the fact was accidentally omitted in the Catalogue (Stein, Zeitsch. f. Hym. u. Dipt., 1901, 203, 209).

rufitibialis. Probably recognizable, but not known from the mainland of North America, and not seen by me.

serotina. I cannot make out any tangible characters.

The following species is added (mentioned in the appendix to the Catalogue, in the 1904 literature):

polita Coquillett, Invertebrata Pacifica, I, 34.—Ormsby Co., Nevada.

The bibliography since 1904 is mostly unimportant, consisting of notices of the occurrence of some of the widespread species in new

localities; it is therefore not mentioned herein except where something of special interest is brought out.

TABLE OF SPECIES OF *LISPA*.

Males.

1. Fifth abdominal segment black, with a chalk-white central spot above, conspicuous from behind .... 2.
   Fifth abdominal segment not so marked .... 7.
2. Second joint of middle tarsus shorter than the third .....*sordida* n. sp.
   Second joint longer than third .... 3.
3. Palpi black, vibrissæ wanting .... *palposa* Walker.
   Palpi yellow or whitish .... 4.
4. Hind tarsus as long as its tibia .... *salina* n. sp.
   Hind tarsus shorter than its tibia .... 5.
5. Fourth joint of middle tarsus prolonged in a slender spine as long as the fifth joint .... *spinipes* n. sp.
   Fourth joint not with spine; with unusually long hairs between and outside of the fronto-orbital bristles .... 6.
6. Vibrissæ delicate, hardly distinguishable; sides of face bare above *brevipes* n. sp.
   Vibrissæ normal, sides of face above with rather coarse hairs *johnsoni* n. sp.
7. Front metatarsus with a prolongation beside the following joint .... 8.
   Front metatarsus without such prolongation .... 9.
8. First two joints of front tarsi reddish; the second more than twice as long as the body of the first .... *tentaculata* De Geer.
   Second joint hardly longer than the first .... *patellata* n. sp.
9. Front tarsus elongated (its first two joints as long as its tibia), pale in the middle, last point enlarged, triangular, black ... *albitarsis* Stein.
   Front tarsus of ordinary form, about as long as tibia .... 10.
10. With four post-sutural dorso-centrals .... *nasoni* Stein.
    With three .... 11.
11. Tibiæ black .... 13.
    Tibiæ red .... 12.
12. Abdomen with a pair of large, shining black, sub-confluent spots on each of segments 2, 3, and 4; antennæ long, front narrowed below *uliginosa* Fallén.
    Abdomen pruinose, with only faint traces of spots; antennæ shorter, front not narrowed below .... *antennata* n. sp.
13. With distinct white spots on the 4th and 5th abdominal segments *sociabilis* Loew.
    Without such spots .... *polita* Coquillett.

Females.

1. With four post-sutural dorso-centrals .... *nasoni* Stein.
   With three .... 2.
2. Palpi black .... 3.
   Palpi pale .... 4.
3. With a heavy velvet-black band from eye to eye across the root of the antennæ .... *palposa* Walker.
   With a faint band or none .... *sordida* n. sp.
4. Abdomen wholly shining black .... *polita* Coquillett.
   Abdomen largely pollinose .... 5.
5. Palpi gradually enlarged, with straight sides .... 6.
   Palpi suddenly enlarged, with curved sides .... 8.
6. Sides of face narrow and with a few fine hairs .... *albitarsis* Stein.
   Sides of face wide and with numerous coarse hairs .... 7.
7. Abdomen with two large, shining black areas on each of segments 2, 3, and 4 .... *uliginosa* Fallen.
   Abdomen almost wholly gray pollinose .... *antennata* n. sp.
8. Third and fourth abdominal segments with a white pollinose spot (rarely yellow) on each side, the middle shining black or with a pollinose spot behind .... *tentaculata* De Geer.
   sociabilis Loew.
   patellata n. sp.
   Third and fourth abdominal segments rather uniformly grayish pollinose 9.
9. Front at antennæ narrower than either eye .... *spinipes* n. sp.
   Front at antennæ wider than one eye .... 10.
10. Bristles of under side of hind femora much larger beyond the middle *salina* n. sp.
    Bristles of the under side of hind femora equally large on the basal half *johnsoni* n. sp.

Lispa sordida new species.

Male.—Head 3.21 times the width of the front at narrowest place; ocellar triangle yellow pollinose, frontal orbits gray, the rest of the front dull black; antennæ wholly black, third joint small, 1½ times as long as second, arista short, with thin long plumosity; sides of face silvery, with only a few hairs on the lower part; middle of face brownish-yellow pollinose; vibrissæ of moderate size, surrounded with only a few small hairs; palpi dark brown to black, occasionally reddish-brown, dilated rather suddenly to a medium size for the genus; the outer side of the dilated portion seems in the normal position to show as a white pollinose spot from in front. Occiput brownish pollinose.

Mesonotum half-shining or less, the pollen gray or brownish; one pair of small prescutellar bristles, the hairs of the scutellum long; halteres yellow with brown knob; calypters ivory-white with faint yellow border.

Abdomen narrow, a little flattened, with gray pollen, which in some specimens becomes brownish on the sides; the second segment has a subshining

spot each side on the posterior half; on the third the same parts are more shining; the posterior half of the fourth is shining, but narrowed at the sides; the third segment has appressed marginal macrochætæ, the fourth has about 4 discal and 8 marginal ones, not appressed; the posterior edge of the fourth sternite stands out from the body, is very hairy, and has a notch in the middle, as well as several bristles; fifth tergite moderately prominent, hairy and bristly, velvet-black, with a chalk-white median dorsal spot extending the whole length and about one-third the width. Organs of the hypopygium closely folded in, not distinguishable.

Legs entirely black, knees not appreciably lighter; front legs plain, the tarsal joints of regularly decreasing length; middle femora rather long, a little attenuated at tip, with two or three excessively long hair-like bristles on the front side at base and a few shorter, but still long ones on the under side at base; middle tibiæ long, with one bristle on the front outer side and two on the hind outer side, before the preapical; middle tarsus with a shortened second joint, which in specimens is generally bent at an angle with the first and third,—it is of normal structure, shorter than the third and about the same length as the fourth; hind femora rather slender, the under bristles strong, hind tibiæ with two small bristles near the middle; hind tarsi short, their tibiæ 1.39 times their length, first joint as long as all the others, which taper off and end in unusually small claws and no pulvilli.

Wings faintly brownish, veins brown. Length 6 mm.; of wing 5 mm.

Female.—Front wider than in the male, the head 2.42 times its width; tarsi of plain structure, hind ones barely shorter than their tibiæ; abdomen generally less shining, sometimes with median blackish stripe, fifth segment with 6 or 8 discal macrochætæ, fifth and sixth segments retracted, but with a trace of white mark above. Length 8 mm.; of wing 6 mm.

Numerous specimens of both sexes, collected at the edges of saline water (Box Elder Lake), Brigham City, Utah, July 4 and 5, 1911.

Lispa palposa Walker.

Male.—Front nearly black (the head 2.62 times the front in width), upper part of the ocellar triangle brown, orbital margins narrowly yellowish, with a single row of hairs next to the eye; a very striking velvety black band from eye to eye at the level of the insertion of the antennæ and below; antennæ black, the first two joints velvety, arista long-plumose; sides of face with a clear silvery sheen, bare except low down; middle of face concolorous; vibrissæ hardly distinguishable from the small bristles of the sides of the mouth; palpi velvety black, suddenly enlarged about the middle, with long black hairs on the front and lower edge; proboscis black, of ordinary form; the usual erect small bristles of the back of the head arranged somewhat in rows.

Thorax black in ground color, gray pruinose, with the beginnings of four black stripes in front, the median two more distinct and extending farther back; chætotaxy normal; calypteres ivory-white with brown border; halteres yellow with brown knob.

Abdomen rather depressed for a ♂, black, almost shining, with the following parts light gray pruinose; a broad anterior spot on each side of the second and third segments, connecting with a broad central portion extending the whole length of the segment; on the fourth segment the lateral spots are even larger and sometimes brown pruinose, while the central spot is small and indistinct, so that the middle is shining black in front; fifth segment velvety black, with a triangular pure white pruinose spot above, very conspicuous. Venter blackish gray, with long bristles on the first segment. Bristles of the sides of the abdomen rather abundant, appressed on the second and third segments, erect and dense on the first, fourth segment with about three discal on each side and a row of marginal slightly interrupted in the middle; fifth with rather delicate but numerous bristles.

Wings subhyaline, of normal form.

Legs black with thin whitish pruinosity; knees hardly at all lighter; middle femora a little slender toward the apex, tibiæ with a pair of bristles on the outer side just below the middle; hind femora below with a row of about 9 bristles, becoming long and slender past the middle, and a single bristle on the hind and outer side below the middle of the tibia; the tibia has also rather long hairs on the outer side; hind tarsi considerably shorter than their tibiæ (tibia 1.37 times the tarsus), the first joint almost as long as the other four. Length 6 mm.

Female.—Head about 2.50 times the front in width, but varying somewhat; face with a few scattering hairs on the sides; vibrissæ generally well developed. Abdomen more flattened, the median gray areas of the second and third segments wider and more diffuse and with a slender longitudinal line in the middle. Hind tarsus longer, almost equaling its tibia, the first joint considerably shorter than the following four. Length 6.6 mm.

In both sexes the front is not at all narrowed below. The abdominal coloration as usual is sometimes not quite so well developed as described above.

Many specimens: Lawrence, Kans.; Brookings, Elmira and Pierre, S. D.; Cache Junction, Utah; Moscow and Elk River, Ida.; Hood River, Ore. Some of the specimens are cotypes of Stein's *nigromaculata.*

Lispa salina new species.

A large, hairy, gray species, with yellow palpi and a conspicuous white spot on the tip of the abdomen in the male.

Male.—Head 2.44 times front in width; front brown, this color running to a point near the antennæ between two black patches which fade into brown above; around and behind the ocellar triangle are numerous small hairs; the upper two pairs of orbital bristles divergent, the remainder, about 6 pairs, decussate; a row of proclinate hairs on the orbit outside the bristles; viewed

from below, the lower projecting edge of the front is black from the insertion of the antennæ obliquely upward to the eye. Antennæ velvet black, third joint hardly twice as long as the second and more slender than it, arista thickened on the basal third and with about a dozen long hairs, none originating beyond the middle. Sides of face silvery above on the outside of the ptilinal suture, the rest brassy, hairy outside the suture from the middle of the silvery part to about the lower corner of the eye. Palpi rather dark yellow, enlarging with moderate suddenness toward the tip, of medium size for the genus, hairy all over except a small space beyond the middle. Proboscis black, shining. Back of head convex, more so below, gray with bushy black hair, which is especially long on the oral margin; occiput with hairs above and a pair of post-vertical bristles, bare below these.

Thorax gray, with black hair almost all over, bristles as usual in the genus; pleuræ concolorous with dorsum, bare behind the front and middle coxæ and in front of the prothoracic spiracle. Calypters wax-white with yellow border. Halteres with brown knob, stem yellow.

Abdomen robust, gray all over the first four segments, slightly yellowish above, with long hair; along the sides some macrochætæ are hardly distinguishable from the large hairs; 4th segment with a terminal circle of machrochætæ and a discal row that is interrupted in the middle; 5th segment velvet black, hairy, with a conspicuous median dorsal chalk-white spot.

Legs very hairy, gray throughout, the tarsi more blackish with pale yellow pubescence below, pulvilli pale yellow. Front legs: coxæ with a row of strong bristles on anterior side; femora with a double row of bristles on upper outer side and a single row on lower; middle femora with two preapical bristles; middle tibiæ with two bristles near the middle; hind femora with the usual rows of long bristles and besides them numerous very long hairs below on the basal two thirds; hind tibiæ exactly equal to their tarsi in length, with one bristle near the middle. All the tarsi have the basal joint shorter than the other four combined, the latter of approximately equal length in each tarsus.

Wing subhyaline, veins yellowish toward the base, 3d and 4th veins not convergent.

Female.—Head about 2.06 times front in width; abdomen with a dark median line (sometimes faintly visible on the basal segments in the ♂), and sub-shining blackish lateral spots on the hind margin of the second and third segments; the median stripe is usually widened on the anterior part of the second and again on the third segment; 4th segment entirely sub-shining blackish; 5th segment minute, black. No long pile on under side of hind femora. Length, ♂, 5.5–7.2 mm.; ♀, 6.5–9.5 mm.

Many specimens of both sexes: South end of Great Salt Lake, Utah, July 31, 1908 and July 9, 1911; Pyramid Lake, Nevada, July 16, 1911; Walker Lake, Nevada, July 25, 1911; Borax Lake in Lake Co., California, August 8, 1911.

I sent some of this material to Mr. Theodor Becker, Liegnitz, Prussia, in 1908, as he had recently published a revision of the palæarctic species of *Lispa;* he informed me that he could not distinguish this species from one which he had described as *L. cinifera*, from Siberia. Since then I have referred it to that species until very lately, when I have come to the conclusion that it is different. *Cinifera* is known in only a single ♂ specimen, not very well preserved, and a complete comparison cannot be made. The description of *cinifera* states that the hind metatarsus is longer than all four of the following joints, a rather striking character which does not apply to *salina;* the long pile of the under side of the hind femur is not mentioned in the description of *cinifera,* but is conspicuous in *salina.* These with some slighter discrepancies, together with the wide difference of locality, lead me to believe that it would be dangerous to accept the view that *cinifera* includes our American form.

This is a very characteristic fly of the shores of the denser salt and alkaline lakes of the West. Although I did not find the larvæ, they will probably be found under the beach refuse, which in the case of Great Salt Lake consists almost entirely of the puparia of *Ephydra gracilis* Pack.

Lispa spinipes new species.

A smallish gray species with narrow front and face, the short 4th joint of the middle tarsus in the ♂ ending in a long slender appressed spine, which reaches to the tip of the slender 5th joint.

Male.—Front much narrower than either eye (the head 3.22 times its width), hardly narrowed toward the antennæ; face narrow, especially the sides, which have only a single row of small hairs, none above the middle; the whole face pale yellow, more whitish at the edges; vibrissæ very small; antennæ wholly black, of ordinary form; palpi yellow, of moderate size for the genus and widening to the apical part with about the usual suddenness, with a few black hairs except on the middle of the dilated part.

Thorax wholly gray, with the usual chætotaxy; halteres yellow with brownish knob, calypters white with faint yellow margin.

Abdomen gray, no median stripe, sides of second and third segments very faintly darker behind, fourth segment changing to yellowish; fifth segment black, almost all the dorsal half pure white; hypopygium inconspicuous, black.

Legs uniformly gray except the knees and a little of the base of each tibia, which are yellowish red; pulvilli rather small, brownish; front tibiæ with only subapical bristles, their tarsi longer than the tibiæ; middle femora slender toward tip; middle tibiæ with two smallish bristles just beyond the middle; middle tarsi considerably shorter than their tibiæ, the second, third and

fourth joints all short, the fourth ending in a spine which continues along the fifth joint to the claws; fifth joint attached to the fourth at one side before the tip, much longer and more slender than usual. Hind tibiæ with a row of small bristles down the hind side, one of which beyond the middle is of uncommon length. All the femora are rather slender. Hind tibiæ 1.70 times as long as their tarsi.

Wings of ordinary structure, hind crossvein not much more than half its length from the margin, straight and moderately inclined. Length 5.5 mm.; of wing 3.8 mm.

One ♂, collected by me at Lake Elsinore, California, on August 2, 1911. One ♂, one ♀, Lewiston, Ida., Aug. 2, 1912. The female is rather teneral and the head and front width cannot be accurately determined; the front is evidently narrow however. The middle tarsi are of simple structure.

Lake Elsinore is a moderately alkaline body of water; but *spinipes* it appears is found also in fresh water, as at Lewiston, Idaho; in this respect it is unlike *sordida, salina* and *antennata,* which have been found so far only at alkaline or salt water.

Lispa brevipes new species.

Male.—Eyes nearest together at the level of the antennæ, where they are separated by considerably less than the width of one eye (head 2.9 times the width of the front); front blackish anteriorly, brown above, the acuminate brown ocellar triangle indistinct toward the antennæ; frontal orbits with long hairs between and outside the bristles; a heavy black band connects the eyes across the base of the antennæ, slightly up-turned at the eyes, just as in *palposa;* antennæ velvety black on first two joints, the second not with paler apical margin, third joint as usual; sides of face silvery, without hairs except a few on lower part; middle of face brassy; vibrissæ decidedly less developed than in most species, with numerous hairs on the outer side of each; palpi brownish-yellow, not quite so large nor so suddenly dilated as in *tentaculata,* moderately hairy. Thorax on the dorsum grayish, sub-shining, a paler pruinose median stripe, which disappears posteriorly and has a faint brown stripe upon it; the beginning of another gray stripe each side at the front end of the dorsocentral rows; humeri gray; chætotaxy normal; halteres with brown knob, calypter ivory-white with yellow border; wings normal. Abdomen rather flat and wide, the first four segments almost uniform light-gray dusted, fifth segment black, with a conspicuous chalk-white, almost silvery triangular median dorsal spot; fourth segment with discal and apical row of bristles; venter unicolorous, a little darker than dorsum, fourth sternite with a deep, rounded incision. Legs including the knees entirely black, with uniform gray pruinosity; front tarsi of almost the length of their tibiæ, the first joint fully as long as all the rest; middle tarsi about three fourths as long as their tibiæ, slender; hind tibia 1.47 times as long as its tarsus, the basal

joint of the tarsus somewhat thickened, about equal to the following four, the second longer than the third. Front tibia without a bristle at the middle; middle femur slender beyond the middle, the bristles on the basal part rather long and slender; middle tibia with two bristles below the middle; hind femur not very stout, with long slender bristles in the row beneath, the tibia with long hairs on the outer side and one bristle below the middle. Length 6 mm.

One male, Moscow, Idaho, August 6, 1912. The female has not been discovered.

In this species the band across the base of the antennæ resembles *palposa*, and the rather dark palpi and faint vibrissæ tend in the same direction but to a less degree. The absence of pattern on the abdomen shows more of a likeness to *johnsoni*, which however has fully developed vibrissæ.

Lispa johnsoni new species.

Male.—The only male specimen is somewhat teneral, and the front part of the head is shrunken, making a full description difficult. The front appears to be much as in *brevipes*, and there are indications of the black band across the base of the antennæ; the hairs between the fronto-orbitals and outside them are long and coarse; the sides of the front have hairs almost up to these but not so large, although well developed for the location; vibrissæ of full size, and a row of good-sized bristles extending back from them along the epistoma; antennæ in the specimen teneral and shrunken, not showing any unusual features. Palpi dark yellow, slightly brownish, of full size for the genus, rather suddenly enlarged, hairy all over except a small space near the distal edge of the disk. Thorax gray, sub-opaque, very indistinctly striped, or with faint indications of stripes, the bristles strong; a small prescutellar pair is present, otherwise the chætotaxy is normal; halteres with a brown knob; calypters ivory-white with yellow margin; wing normal. Abdomen not flattened, near the base having a section like an equilateral triangle with the corners rounded, almost unicolorous gray, with a slender abbreviated median blackish stripe and on the lower part of the side in the third and fourth segments a trace of a dark triangle; fifth segment black with a distinct chalk-white median dorsal spot. Fourth segment with irregularly placed bristles on the sides of the disk, and a marginal row. Legs wholly black, including knees, gray dusted; femora rather stout and hairy; front tarsi fully as long as their tibiæ, the first joint almost as long as the following four; middle tibia with two spines considerably below the middle; hind tibia with one stout bristle below the middle, 1.64 times the length of the tarsus, first joint of the tarsus not quite so long as all the rest; the hind femur has on the lower edge the usual row of about ten slender hairlike bristles.

Female.—In good condition. Head 2.20 times as wide as front, the latter with a velvet black band sharply defined on its lower border; first two joints of antennæ velvet black; sides of face rather coarsely hairy all the way up

to the front; vibrissæ strong; palpi as in the male. Thorax gray with two well-defined narrow blackish stripes destitute of hairs inside of the dorsocentrals, not continuing much back of the suture; outside the dorsocentrals a less distinct stripe. Abdomen gray with a black median stripe extending to the fourth segment. Hind tarsus as long as the tibia. Length, 6.8 mm.

One male, two females, Cohasset, Mass., Sept. 9, collected by C. W. Johnson.

This species is rather closely allied to *salina,* but in the male has the hind tarsi shortened and the hind femora destitute of the very long, almost woolly hairs of that species; in the female the palpi are larger, darker, and more hairy than in *salina.*

The difference between *johnsoni* and the Central Asian *cinifera* is not easy to state, as in each the male is known only from a rather poorly preserved specimen; they are closely allied.

Lispa tentaculata De Geer.

Male.—Head 2.89 times the width of front, the latter narrowed somewhat strongly below, the sides convex; the narrowest point is below the insertion of the antennæ, and is about the same as the width of one eye at the widest point (looking from straight in front); color of front black, indistinctly brown on the ocellar triangle and narrowly forward from it, the orbits becoming gradually yellow about the middle, which color continues down the side of the face without interruption; the fine hairs of the frontal orbit continue without interruption down the side of the face; antennæ black, second joint faintly and narrowly yellowish at apex, third reaching nearly to the single bristle above the vibrissa, arista rather long plumose; face including its sides golden yellow pruinose, the sides with a few fine hairs which extend almost to the lower edge of the eye; vibrissæ strong, with some smaller bristles which are more numerous and slender posteriorly; palpi very large, shining pale yellow, suddenly enlarged about the middle, the apical broad part with scattered black hairs.

Thorax black in ground color, grayish pruinose, sub-shining with a median vitta abbreviated in front and two less distinct lateral vittæ along the dorsocentrals, at the extreme front two black vittæ begin between these, but fade away in a short distance. Chætotaxy normal; calypteres ivory white, with yellow margins; halteres dark yellow. A tuft of small black bristles arises from just behind the metathoracic spiracle.

Wings entirely normal for the genus.

Abdomen very broad and flat; the first segment grayish pruinose; the second segment with white pruinosity anteriorly on the sides, which changes to yellowish and extends mesially and posteriorly so as to leave three areas shining black—the hind part on each side and the middle part in front; third segment with a large definite white pruinose spot on each side against the front border, and a median yellowish brown pruinose spot on the hind margin,

the rest shining; fourth segment with a still larger white pruinose spot on each side against the front border, the rest shining; fifth segment wholly shining black, but little visible. Venter grayish white. Bristles of abdomen not of noticeable size except on the fourth and fifth segments.

Legs and pleuræ covered with plumbeous pruinosity; knees yellow; front tarsi of very characteristic structure, longer than their tibiæ, the first joint short, usually yellow, with a tuft of black bristles below, and prolonged in a yellow process along the side of the second joint, the process one half longer than the first joint itself, and with a black tip; second joint yellow, about half as long as the tibia; remaining joints becoming darker, longer than in most species. Middle femora rather slender and blackish toward the apex, with only short hairs and bristles, their tibiæ with a single bristle on the outer side at the middle, their tarsi slender and long, a little pale at base; hind femora with long, slender bristles or hairs below in a sparse row beginning before the middle, the tibiæ with about three irregularly spaced bristles on the hind side and soft, long hair on the inner side; hind tibia 1.03 times the tarsus, first joint of the latter with a brush of hair below, not much over half as long as the four following. Length 5.5 mm.

Female.—Head 2.35 times the front in width; front tarsus black, the first joint of ordinary form, nearly twice as long as the second, the whole tarsus about 1½ times the length of the tibia, hind tarsus a little longer than its tibia; the hind femur generally has a single long, hairlike bristle on the under side beyond the middle (occasionally two). Palpi not quite so shining, but nearly as large as in the ♂. Length 7 mm.

This is the most abundant species; Becker reports it everywhere common in Europe around fresh water, also from the Canary Islands and Central Asia. I have it in abundance from South Dakota, Kansas, Idaho, Utah, Nevada, Oregon and Washington, and it has been recorded from New England and California. It is seldom sought in vain at the edge of fresh water during the entire collecting season, in my experience.

Sociabilis and *patellata* are very closely related to this species; the differences I have summarized under their respective descriptions.

Lispa patellata new species.

Male.—Head 2.70 times the width of front, the latter widening very slightly above, blackish including the middle and upper parts of the orbits; the last with fine hairs which continue uniformly down the sides of the face; entire face including sides brown pollinose, no band across root of antennæ; antennæ black, second joint at tip with a white pollinose roundish spot when viewed diagonally from below; arista rather thin pilose; vibrissæ large, with smaller bristles extending back under the head; palpi of immense size, glistening white, slightly flesh-colored, as wide as the full length of the antenna and the enlarged part nearly a half longer, suddenly widened downward from the

stalk-like portion, with only a few hairs, which are on the lower edge and the inner side. Thorax narrow, slightly brownish-black, not with noticeable vittæ; hairs and bristles well developed, chætotaxy normal; pleura changing color to a somewhat glaucous below; calypters white, with pale yellow border; halteres yellowish; wings of ordinary structure, the veins brownish toward the base. Abdomen considerably flattened, oval in outline; second, third and fourth segments with successively larger white pollinose triangles on the sides, middle of second and third segments with an indistinct yellowish pollinose spot; otherwise the abdomen becoming more shining black toward the tip; fifth segment black, showing very little from above; bristles of abdomen not very large. Legs wholly black except the first and second joints of the front tarsus, which are more or less reddish,—the first short, with a process extending along the outer side of the second, nearly as long as the first and two thirds as long as the second, the following joints of the front tarsus black and somewhat flattened; middle and hind femora moderately elongated and slender, the latter with two or three slender bristles below beyond the middle; middle tibia with a small bristle on the hind side at the middle, hind tibia with a bristle on outer side at the middle, 1.08 times as long as its tarsus. Length 6 mm.

Female.—I am unable to indicate any satisfactory character on which to separate the ♀ from that of *tentaculata*.

Seven males: Boulder, Colo.; Moscow, Kendrick, Peck, Juliaetta and Potlatch, Idaho. Dates in Idaho are April 18, June 11, 18 and 28, and September 10. Two females collected at Boulder, which may be this species (I got no males of *tentaculata* while collecting there), have reddish middle and hind tibiæ, comparatively small palpi, and brown dust on the thorax.

The type locality is Moscow.

Lispa albitarsis Stein.

Male.—Front narrow, especially below (head 3.85 times the width of the front, the narrowest front in the genus); the usual acuminate frontal triangle very indistinct; sides of face very narrow, with a few hairs all the way up; whole face light brassy yellow; antennæ black, third joint rather long, arista brownish-yellow, loosely plumose; second joint with indistinct brownish-yellow band at apex; vibrissæ large and stout, on the outer side of each a few coarse hairs curving downward; cheek very narrow below the eye; palpi yellow, gradually expanded from the base, the widest part narrower than in any other species found in North America, equal to about one third the length of the third joint of the antenna. Thorax rather narrow, glaucous on the anterior half with three brown stripes, which become indistinct on the more shining portion behind the middle. Coxæ and femora black, the front coxæ silvery in front, with few bristles; front tibia black; front tarsus elongated, once and a third the length of the tibia (tibia is .74 the length of the tarsus);

first joint long and slender, pale at tip; second and third joints of medium and equal length, slender, yellowish-white; fourth and fifth joints flattened, black, the claws large and divergent; pulvilli enlarged, snow-white; middle tibia and tarsus rather dark brown than black, the former with a large bristle below the middle on the front side, and a smaller one above it on the hind side; hind tibia yellowish-brown, darker toward the base, with only two bristles before the apical ones,—these two are on the outer side; the hind tibia is .94 times the length of the hind tarsus; the latter dark brown; the hind femur has two large bristles on the under side, before the middle. Wings ordinary, calypters white with pale margin, halteres yellow. Abdomen depressed, mostly shining black above, but with a white pollinose transverse spot on the hind edge at each side on segments 1, 2, and 3, which runs over a trifle upon the front edge of the succeeding segment; also one large bristle on each side of segments 2 and 3, and on the fourth segment a terminal circle of six and a sub-basal lateral pair; hypopygium small and retracted. Length 4 mm.

Female.—Head 2.74 times the width of the front; frontal triangle as usual; thoracic stripes not distinct; front tarsi hardly longer than tibiæ, plain, the tibiæ brownish-yellow at base; hind femur with only one moderate bristle below; middle tibiæ brownish, the hind ones reddish-brown, near the base with a darker ring. Length, 5.1 mm.

Two males and one female, from the type lot: Lawrence, Kans., Tifton, Ga., Opelousas, La.

A somewhat aberrant species, very well marked.

Lispa nasoni Stein.

Male.—Front wide above, considerably narrowed at the antennæ, where the eyes have enlarged facets; head about 3.10 times the narrowest width of front; orbits yellowish pollinose; face rapidly widening below, wholly silvery with a yellowish tinge, the sides with small scattering hairs meeting those of the frontal orbit, antennæ deep black, a distinct red band at tip of second joint, third joint somewhat elongated; cheek below eye rather wide; palpi yellow, gradually widened from the base, the greatest width only about half the length of the third antennal joint, with a few black hairs except on the disk. Thorax cinereous, with a fairly distinct median brown stripe extending to the tip of the scutellum, a less distinct lateral stripe each side, and some indications of another outside this, mostly behind the suture; four dorso-centrals behind the suture, the anterior two of them smaller than the posterior two; halteres yellow; calypters white, border very pale. Legs black, the femora rather broadly at tip, and all the tibiæ, yellow. Front coxæ with only about ten bristles on the front side,—less than in most species; middle tibia with a medium bristle on the outer front side about the middle, and a small one opposite it on the outer hind side; hind tibia 1.06 times the length of its tarsus, with a medium bristle below the middle on the outer side; hind femur with a short row of only three bristles on the outer side below, ending

about the middle, and generally a single bristle in place of the inner row. Abdomen cinereous, with a pair of shining black spots on each of the first four segments, the first pair small and indistinct; the median cinereous line is of the same color and texture as the rest of the cinereous surface (in *uliginosa* generally delicate and indistinct); fourth segment from a third to a half the length of the third; fifth segment rounded, with an inverted V-shaped notch below. Wings of ordinary structure. Length, 5 mm.

Female.—Head and front wider, the proportion about 2.51; hind femora below with only one bristle. Length 6 mm.

Eleven specimens of both sexes, six of them from the typical material determined by Stein; South Dakota; Louisiana and Georgia (Hough); Redwood City and Lake Elsinore, Cal.; Winnemucca and Pyramid Lakes, Nev.; Roswell, Ida.; Havana, Cuba (C. F. Baker). One male has on the hind femur four bristles in the outer row below and three in the inner.

The species is most related to *uliginosa*, from which it differs in the number of dorso-central bristles, and in the ♂ by having a shorter abdomen, fewer and more delicate hairs on the sides of the face, dorsum more distinctly striped, narrower face, and fewer bristles on lower side of hind femora.

Lispa uliginosa Fallen.

Male.—Head 2.80 times as wide as front, the latter wide above, narrowing appreciably toward the antennæ, with the usual long, narrow frontal triangle; margins a little silvery below the middle; compound eyes with a distinct area of enlarged facets about the level of the antennæ; antennæ of usual form, black, the second joint with a transverse yellow band at tip, which looks whitish in certain lights; face including its sides and the anterior part of the cheeks yellowish-gray, with a somewhat silvery reflection; sides of face with a few hairs extending up to the front, at the level of the vibrissæ these are quite strong; palpi pale yellow, gradually enlarged almost from the base, not very wide in the widest place—hardly half as wide as the length of the third antennal joint—with a rounded bare spot in the widest place, elsewhere with coarse black hairs. Thorax only moderately pollinose, half-shining, with strong bristles arranged as usual; halteres yellow, calypters white with pale yellowish border. Legs black, except extreme apices of the femora and all the tibiæ, which are yellow; tarsi entirely black; middle tibia with a long bristle on the front side well below the middle, and a small one on the hind side at the middle; hind tibia .98 times the length of its tarsus, with one bristle on the outer front side below the middle, and a row on the outer hind side, of which the one at the middle is largest; hind femora with two rows of stiff, rather short bristles below, and the usual strong row above. Abdomen long and almost cylindrical, the fourth segment hardly half as long

as the third; fifth protruding in almost hemispherical form, the first four segments have each a large shining black spot on the dorsum, interrupted by a rather indistinct median gray pruinose line; on the second and third segments these spots are triangular, narrowing forward almost to a point, while behind they are almost as wide as the dorsum; along the side of the second and third segments there is an indistinct brown streak; remainder of abdomen ashy-gray pollinose, the hairs arising from brown dots. Wings as usual. Length, 6 mm.

Female.—Head about 2.47 times as wide as front; sides of face considerably wider and more hairy, otherwise all the characters of the male are found, even the enlarged facets; in the place of the two rows of bristles on the lower side of the hind femur there is only a single bristle or sometimes two. Length, 7 mm.

A common and widespread species, occurring in Europe and throughout the United States. Specimens are in my collection from Buffalo, N. Y. (M. C. Van Duzee); Algonquin, Ill. (Nason); Brookings, S. D.; and a number of places in Idaho, Utah, Nevada, California and Washington. It is on record from St. Vincent, W. I.; Mexico; Florida, Ontario, etc.

Lispa antennata new species.

A slender species with opaque abdomen, wide sides of face and cheeks, and second antennal joint tipped with reddish-yellow.

Male.—Head 2.06 times as wide as front, the latter very little narrowed at the antennæ, frontal orbits narrow, more distinctly yellow anteriorly; antennæ black, second joint at tip narrowly reddish-yellow, which changes to whitish when viewed from below, third joint short, arista with long plumosity; face wholly grayish-white pollinose, wide above and rapidly becoming still wider below on account of the triangular form of the facialia, which are nearly as wide at the level of the vibrissæ as the sides of the face are; the hairs of the frontal orbits continue down on the sides of the face or facial orbits to about the level of the vibrissæ, but are scattering on the upper part; a single large vibrissa with three or four small bristles in a row laterad across the lower end of the facialium; palpi light yellow, with a rather sudden enlargement, covered with scattering black hairs except on the outer side in front, where there is a bare, glistening whitish spot.

Thorax cinereous, with no dark longitudinal lines except at the very front edge; chætotaxy normal, bristles well developed; pleuræ concolorous; halteres yellow; calypteres ivory-white.

Abdomen cylindrical, cinereous, second and third segments each with a dull blackish spot on each side, rather faint (on the first segment still fainter), fourth segment capable of a good deal of retraction and generally exposed for a much shorter length than the preceding ones; fifth segment very narrow and visible only for a small space dorsally; hypopygium of moderate size, con-

colorous with rest of abdomen; third and fourth segments with a row of marginal bristles, first and second with irregularly placed bristles along the sides; third segment with a V cut out beneath where the sternite would be.

Femora black, robust, tibiæ rather dark yellow, tarsi yellow, infuscated toward the tip, with large yellowish pulvilli. Front tibia with a bristle beyond the middle on the outer side, and one on the front side a little lower down; front tarsi plain; middle femora with a row of bristles on the front side that extends only to the middle, and two preapical bristles on the hind side; middle tibia with a bristle on the outer hind side just beyond the middle and another on the outer front side a little lower down; hind femora with the usual three rows of bristles; hind tibia .98 times the length of its tarsus, with a bristle below the middle on the hind side, above this a row of two to four small bristles, and below it on the outer side a small bristle.

Wings of ordinary structure, the veins yellowish. Length 7.3 mm.; of wing 5.2 mm.

Female.—Head 1.92 times the front in width; sides of face wider and more hairy; palpi not so suddenly enlarged, but about as wide; a faint brown line in the middle of the thoracic dorsum; a single bristle on the under and outer side of the hind femur, representing the row that occurs in the ♂; hind tibia. Length 7.4 mm.; of wing 5.8 mm.

Fifteen specimens, of both sexes, collected at Pyramid Lake, Utah, along the shore at the south end, July 16, 1911.

Lispa sociabilis Loew.

Centuries, ii, 72.

Male.—Almost like *patellata,* but with the following differences: head 2.86 times front in width; palpi less widened, but still very large, about as wide as the length of the third antennal joint, while in *patellata* they are fully as wide as the length of both second and third; color as in *patellata,* almost white, glistening, and with few hairs. Front tarsi with first joint yellow, on the outer side with only an insignificant point where the prolongation occurs in *patellata* and *tentaculata;* second joint yellow, sometimes blackened from the middle, about three fourths as long as the first joint, the remaining joints of nearly equal length, black, somewhat flattened; all knees and extreme tips of tibiæ yellow; middle and hind tarsi yellow on under side at least to tip of first joint; hind femur generally destitute of slender hairlike bristles on under side beyond the middle, occasionally with only one; middle tibia without bristle near middle. Hind tibia 1.27 times as long as its tarsus.

Female.—Head about 2.50 times the front in width, but somewhat variable; palpi nearly as in the ♂; front metatarsus nearly as long as the three following joints, blackish; middle tibia with one bristle near middle; hind femur with one bristle below, beyond the middle (absent in one out of four); tibiæ almost entirely black. Length of ♂, 6 mm.

Seven ♂'s, four ♀'s, Trenton, Lucaston and Iona, N. J.; Mont-

gomery Co., Pa.; Jackson, Miss. Dates, May 16 and 26, Aug. 11, 15 and 21, Sept., 11, Oct. 5 and 30.

The three species, *patellata, tentaculata,* and *sociabilis,* form a group in which the males are separated mainly but readily on secondary sexual characters, while the females offer almost no tangible differences. The group has the tessellated pattern better developed on the abdomen than in the rest of our species, and about equally in both sexes.

Lispa polita Coquillett.

Coquillett, Invertebrata Pacifica, i, 34.—Ormsby Co., Nev.

Harbeck, Entomological News, xx, 46, oc. in N. J.

Male.—Wholly black, the only yellow ground color being in the palpi and a band across the apex of the second joint of the antenna; head 2.62 times the width of front, the latter wide, rather golden along the orbits below; antennæ ordinary; face wide, sordid yellowish white, the sides with fine, sparse hairs, coarser next the vibrissæ; palpi yellow, the basal part whitish, widened gradually from the base, the widest part a little over half as wide as the length of the third antennal joint, with a round, shining space thereon. Thorax sub-shining, with a delicate brownish pruinosity, especially around the humeri; bristles strong, arranged as usual. Abdomen almost cylindrical, shining black, with only the most delicate brown pruinosity; fourth segment one third as long as the third; fifth segment hemispherical; bristles rather strong on the sides and near the apex. Femora all a little thickened, the hind ones with two rows of rather short, strong bristles below; middle tibia with a bristle on the front side below the middle and one on the hind side at the middle; hind tibia 1.04 times as long as its tarsus, with one bristle on the outer front side below the middle, and a strikingly long one opposite it in the row on the hind side. Halteres dark yellow, calypters yellowish with brownish-yellow margin. Wings rather infuscated, the base brownish. Length, 7 mm.

Female.—Head 2.33 times as wide as front; sides of face wider and with more numerous hairs; hind femur with only three or four bristles below; abdomen more oval, not so cylindrical, but very shining; femora hardly thickened; calypters paler. Length 6.6 mm.

Two males, Moscow, Idaho, Aug. 23, and Viola, Ida. (only 8 miles from Moscow), Aug. 21; one female from the type lot, Ormsby Co., Nevada, collected by C. F. Baker and lent me by C. W. Johnson. As shown above, it has been reported from New Jersey.

The structural characters of the species resemble those of *uliginosa,* but the shining black color is very distinctive. The abdomen of the male is longer than that of the female, giving a greater total length in the few cases examined.

ON TRICHIOPODA LATREILLE, POLISTOMYIA TOWNSEND AND TRICHOPODOPSIS NEW GENUS.

By Charles H. T. Townsend,

Lima, Peru.

In 1829 Latreille founded the genus *Trichiopoda,* including therein the two species *Thereva plumipes* Fab. and *T. lanipes* Fab. In 1910 Coquillett designated the first of these as the type of the genus. Since *Musca* (*Dictya*) *pennipes* Fab. was not included by Latreille in his genus *Trichiopoda,* the writer's designation of that species in 1908 as the type of the genus can not hold.

In 1908 the writer founded the genus *Polistomyia* for *Trichopoda trifasciata* Lw. It is now quite certain that the last-named species is congeneric with *Trichiopoda plumipes* Fab. In consequence of this fact the genus *Polistomyia* becomes a synonym of *Trichiopoda.* The yellowish or rust-colored humeri, scutellum and femora of *plumipes* indicate the *Polistomyia* group quite unmistakably. Not only the scutellum and femora ferruginous, but the inner border of wing broadly hyaline and the cylindrical abdomen of the description all indicate *Polistomyia,* the only character not typical so far as the description goes being the apparent absence of yellowish on wing, but this may easily be exceptional and is therefore immaterial. The cylindrical and black abdomen with broad hyaline inner margin of wing might indicate *Eutrichopoda,* but the yellow scutellum and femora preclude this reference. Moreover the description implies a broader hyaline inner border to the wing than that of *Eutrichopoda,* the hyaline being evidently as broad as the black if not somewhat broader. All this points to the correctness of Coquillett's determination of the form as allied with *trifasciata,* in which opinion the writer concurred in 1908 (Tax. Musc. Flies, p. 134).

Coquillett's designation of this species as the type of *Trichiopoda* wholly changes the sense of the latter name and drops the name *Polistomyia* and its derivatives. Furthermore this designation leaves the group of which *pennipes* is typical without a nearer generic reference than *Galactomyia,* whose type is *Trichopoda radiata* Lw. The

pennipes group is well separated from the *radiata* group not only in facies but on leg, wing and abdomen characters, notwithstanding that these largely become in the latter group tertiary sexual characters consisting in form and color of abdomen and coloration of wings, with ciliation of hind legs, etc. The description of the new genus and statements of synonymy are as follows:

Trichopodopsis new genus.

Synonym, *Trichopoda* s. str. Townsend, 1908 (nec Latreille).

Differs from *Galactomyia, Eutrichopoda* and *Trichiopoda* as follows: Abdomen nearly same form in both sexes, more or less flattened, not cylindric in female; concolorous in both sexes, light yellowish, reddish or ferruginous, and without any black in female. Scutellum always black. Wings with inner margin abruptly very narrowly hyaline, the hyaline border not over about one fifth of wing width, in female the wings otherwise wholly black, in male black usually with yellow splotch but no milky radiations; apical cell usually very short petiolate. Femora never wholly yellow or ferruginous, the hind femora not at all ciliate in either sex, the hind tibiæ ciliate only on about the lower or distal half. Parasitic in Heteroptera (*Anasa, Leptoglossus*) so far as known. Deposits flat-oval macrotype eggs on host.

Trichiopoda Latreille.

Type, *Musca* (*Dictya*) *pennipes* J. C. Fab.

Synonyms, *Trichopoda* auct. pt. *Polistomyia* Townsend.

Parasitic in Acridiidæ (*Dissosteira*) so far as known. Deposits flat-oval macrotype eggs on host. Described in Tax. Musc. Flies (1908), pp. 132–133.

NOTES ON AFRICAN MYRMELEONIDÆ.

BY NATHAN BANKS,

WASHINGTON, D. C.

The following, mostly synonymical, notes are based chiefly on a study of types in several European museums; I have gone over these notes with the descriptions and my own material since my return. There are other species upon which I failed to make sufficient references or through lack of material in my collection am unable to verify my suspicions of their synonymy. In a few cases a species described by an old author has not been rediscovered, but it may be in some cases that the locality label is a wrong one.

Acanthaclisis.

Navas has divided this up into a number of genera, several of them on variable conditions of venation. The number of costals crossed or forked varies so much that I fail to see how one can tell where *Sogra* ends and *Acanthaclisis* begins. *Paranthaclisis* Banks (including *Centroclisis* Navas) may be a subgenus as I have already placed it, hardly more.

I have seen the types of many of Navas' new species, but cannot without more study of specimens decide on the validity of all of them.

Sogra superba Navas.

The type agrees with figure and description of *Acanth. felina* Gerst.

Sogra distincta Rbr.

S. difficilis Navas, *S. nigrata* Navas, and *S. perversa* Navas are this species; probably others also belong here. The type expands about 108 mm., and has four dark streaks between the median and cubital veins.

Sogra brachygaster Rbr.

Myrmeleon gabonicus Fairm., and *Acanth. rufescens* Gerst., appear to be the same; *Sogra infernalis* Navas is evidently also a synonym.

Sogra maillardi Selys.

Sogra pertinax Navas and *S. rixosa* Navas, according to types, are this species.

Sogra mordax Navas.

S. iracunda Navas does not differ, except in marks that are variable.

Acanthaclisis longicornis Rbr.

The type has two series of costals except on the basal sixth of wing; ten cross-veins before radial sector in fore wing, eleven branches to radial sector, numerous marks between the radius and subcosta.

Phanoclisis new genus.

Pronotum slender; costals crossed on base, not beyond, otherwise like *Acanthaclisis.*

Type, *Acanthaclisis longicollis* Rbr.

Navas has given the name *Nora* for this species, but that name is long since preoccupied.

The type has about eight cross-veins before the radial sector in each wing, ten branches to radial sector.

Myrmelodes medius Navas.

This is *Myrmeleon doralice* Bks. In my description I mentioned the appearance of two radial sectors upon which character Navas has made his new genus. But there is really but one radial sector (as in all Myrmeleonidæ); the fork of the radial sector has the cross-veins so as to give it the appearance of a branch from the radius instead of a branch of the radial sector. There are no more longitudinal veins than usual in the family. The same structure appears in one species of *Palpares.*

Myrmeleon stigmalis Navas.

This is the widespread *M. obscurus* Rbr.

Myrmeleon buyssoni van der Weele.

This is a true *Myrmeleon,* and in my table of African species runs to 5, but the pronotum is yellowish, with two dark, submedian stripes.

Myrmeleon hyalinus Oliv.

Is a true *Myrmeleon.* The head is gone; the pronotum in poor condition; the metanotum has three pale spots; abdomen black, the segments faintly margined behind with yellowish; hind femora brownish, hind tibiæ dark at tip, spurs scarcely as long as first tarsal

joint; wings acute, and almost falcate at tips; many cross-veins before radial sector in each wing, nine or ten branches of the radial sector; venation entirely pale.

Myrmeleon cinereus Klug.

This is a true *Myrmeleon;* the head has a dark interantennal mark, a spot above it on middle of front, and three spots across vertex; pronotum as figured.

Myrmeleon obscurus Rbr.

Is a true *Myrmeleon,* as identified by Van der Weele; it has seven to eight cross-veins before the radial sector in fore wings, five cross-veins in hind wings, eight branches of radial sector; subcosta, radius, and cubitus strongly marked with dark. *M. capensis* Rbr. appears to be the same species, but rather larger, the venation and markings are the same.

M. fictus Walk. is the same species; *M. secretus* Walk. is probably the same, but the type is broken.

Nesoleon fasciatus Navas.

Is a true *Myrmeleon* and close to *M. obscurus,* perhaps the same.

Myrmeleon ochroneurus Rbr.

Is a true *Myrmeleon.* There is a large mark on front of the head reaching below the antennæ; vertex and pronotum as figured; thorax with some submedian pale spots; legs pale. Wings rather slender and acute, subcosta and cubitus and its branches dotted or spotted with dark, otherwise venation is pale; 14 cross-veins before radial sector in the fore wings, 8 in the hind wings, 10 branches to radial sector, a line through cubital area in both wings; in fore wings the radial sector arises plainly beyond the end of anal vein. Related to *M. lethifer* and *M. medialis.*

Formicaleo madagascariensis Weele.

Is a true *Myrmeleon,* related to *M. furcatus.*

Hagenomyia luctuosa Navas.

This is *Myrmeleon lethifer* Walk., the *M. nigridorsis* Kolbe. In the Brit. Mus. Navas has identified an entirely different insect as *M. lethifer.*

Myrmeleon pulverulentus Rbr.

This is a *Macronemurus,* spurs equal nearly three joints. A slender-bodied species with clouds at ends of all cross-veins; pronotum not very pale and marks not in strong contrast, but distinct; antennæ hardly diameter apart, a large mark above and below the antennæ dark; vertex dark leaving a pale band across the front, two submedian, rather elongate spots behind on vertex. Wings moderately narrow, costals simple, 9 cross-veins in fore wings before radial sector, 7 branches of radial sector, in fore wings four cross-veins between anal and cubital fork, in hind wing but one such vein. In fore wing the radial sector arises a little beyond cubital fork, in hind wing plainly before. Femora pale, tibia marked within, tips of tarsal joints pale, last joint more than twice as long as first, which latter is no longer than second and third.

Myrmeleon infidus Walk.

Is a *Macronemurus* and runs to *M. striola,* but the cross-veins and other veins are all pale except the subcosta is marked with dark; pronotum as figured; spurs equal two joints; five cross-veins before the radial sector in fore wing; besides the apical streak in the hind wings, there are a dozen little dark dots at forks of veins near tip of fore wing.

Nelees modestus Navas.

Runs to typical section of *Macronemurus* and is my *M. cloranthe,* differing only in some tarsal joints not as heavily marked as the type.

Nelees clathratus Navas.

Is *Macronemurus ianthe* Bks.

Formicaleo inæqualis Navas.

This is *Macronemurus euanthe* Bks.

Formicaleo atomarius Navas det.

Is *Macronemurus tinctus* Kolbe.

Formicaleo lituratus Navas.

Is *F. diversus* Navas. It is common in Abyssinia.

Formicaleo lynx Navas.

Runs to *F. hesione* Bks.

Myrmeleon subpunctatus Rbr.

A *Formicaleon;* spurs as long as three joints of tarsus; legs stout, fifth joint of tarsus twice as long as the first. Fore wings broad at stigma, which is reddish, a faint dark dot at end of anal, and at union of the median and cubital veins in fore-wings; in the hind wings an oblique dark streak toward tip, 11 branches of radial sector; antennæ close together, a large dark spot above them, thorax discolored. Runs to *F. harpalyce,* but no marks under antennæ, and the spots in fore wing, as well as smaller size, distinguish it.

Neuroleon extraneus Navas.

This is *Formicaleon lepidus* Kolbe.

Gymnoleon exilis Bks.

Gym. gaillandi Navas (Paris Mus.), *Klapalekus nubilatus* Navas (Brit. Mus.), and *Neuroleon drosimus* Navas (Brit. Mus.) all equal *G. exilis.* The *N. drosimus* has no spurs.

Gymnoleon elizabethæ Bks.

Obus arenosus Navas is this species, there are no spurs.

Creagris parallelus Klap.

This is the common *C. mortifer* Walk.; the name *parallelus* was already used by me for an Indian species.

Creagris cineraceus Navas.

Is related to *C. mortifer,* but marks of pronotum are different as in figure.

Myrmeleon mortifer Walk.

Is the *Creagris* as usually identified. *M. pervirgil* Walk. is the same species. *Creagris infirmus* Navas is the same, but the anal is not as prominently marked as usual. *Creagris plagatus* Navas is also *C. mortifer.*

Myrmeleon africanus Rbr.

A *Creagris* as identified by all; marked (prob. by McLachlan) as equal to *luteipennis* Burm. There are 5 to 7 cross-veins before radial sector in fore wing, 11 branches of radial sector, 11 to 13 cross-veins between anal and cubital in fore wing.

Creagris nigrostriatus McLach.

Is a *Creagris,* spurs about equal to first tarsal joint which is very long; antennæ close together; 7 cross-veins before the radial sector in fore wings, 11 branches to radial sector (McLachlan collection).

Myrmeleon lineosus Rbr.

Is probably a *Myrmecœlurus* and not a *Nesoleon,* but legs gone, and type much broken. Fore wing has 9 cross-veins before radial sector, 6 in hind wings, anal connected to cubital fork five times, 9 branches to radial sector; in fore wings the radial sector arises a little farther out than end of anal vein.

Myrmecælurus lobatus Navas.

Is *M. lœtus* Klug; it occurs also in Abyssinia.

Myrmecælurus lachlani Navas.

Is *M.* (*Myrmeleon*) *quedenfeldti* Kolbe; hardly more than a local race of *M. trigrammus.*

Myrmeleon atomarius Rbr.

Is a *Myrmecœlurus,* and the species I described as *M. subcostatus.* Wings dotted all over, and in fore wing a short brown streak near apex, in hind wing faintly indicated. *Myrmecœlurus apicalis* Navas is the same.

Myrmecælurus sectorius Navas.

A narrow brown margin, except in front where the subcosta is margined brown; an apical streak in fore wings.

Bankisus oculatus Navas.

No spurs, legs very slender; one cross-vein in hind wing before the radial sector, in the fore wing three cross-veins.

Nelees lucasi Navas.

Runs to *Megistopus,* but the fourth joint of tarsus is short, second and third as long as first, legs very slender, spurs as long as the first tarsal joint. Antennæ close together at base. Wings narrow; anal runs far out in fore wings, and in hind wings not quite so far.

Myrmeleon callidus Walk.

A *Neuroleon,* three black stripes on the pronotum; 7 cross-veins before radial sector in fore wings, 11 branches of the radial sector; a dark line up from end of anal, and obliquely near tip.

Gandulus leptogaster Navas.

This is *Neurolcon filiformis* Gerst.

Neuroleon angustus Navas.

This is *N. alcidice* Bks.

Cymothales johnstoni Kirby.

Marks of wings as figured; antennæ black on basal joint, then pale, till near the tip where last few joints are brown; six or seven cross-veins before radial sector in fore wing; two in the hind wing, eight branches of radial sector, the seventh branch soon forks.

Cymothales eccentros Walk.

Marks of wings as in figure; *C. speciosus* Gerst. is very close to it, but the stigmal mark is large and encloses a pale spot, while the two pale spots in the apical mark are more widely separated, and the upper mark of the median stripe is more rounded and contains a pale spot, and the basal band is entire. The color of the antennæ and femur I is alike in the two species.

Cymothales bouvieri v. d. Weele.

The type has three cross-veins before radial sector in fore wings; there are ten branches to the radial sector, the fourth branch soon forked. The pronotum is dark, with two pale parallel lines, a submarginal pale line each side, and an oblique line from the middle of the submedian lines to the outer posterior corner.

Nesoleon.

A great number of species have been described in this genus, but many are synonyms.

Nesoleon variegatus Klug.

Is as I have identified it, very similar to *N. mysteriosus* Gerst., but not as heavily marked, and not showing the pale subapical streaks in the wings; the face mark is about the same, but the branches of the interantennal mark do not enclose a spot as in *N. mysteriosus*.

Nesoleon virgatus Klug.

Is practically the same as *N. variegatus,* but the wings are paler and less marked; the lateral stripe of thorax above is broad.

Nesoleon pallens Klug.

Is as I have identified it; the abdomen has a narrow dark median stripe, as in figure.

Nesoleon lepidus Klug.

Is very similar to *N. pallens,* but the abdominal marks are different; the segments having a mark extending along the posterior sides, as in figure.

Nesoleon erythræus Navas.

= *N. pallens.*

Nesoleon interruptus Navas and **N. divisus Navas** are both

N. variegatus (Brit. Mus.).

Nesoleon rimatus Navas (Paris Mus.).

= *N. variegatus.*

Nesoleon cognatus Navas.

= *N. pallens.*

Nesoleon scalaris Navas.

= *N. lepidus.*

Myrmeleon punctulatus Oliv.

Is a *Nesoleon,* and agrees with *N. pallens.*

Myrmeleon abyssinicus Klap.

= *Nesoleon pallens.*

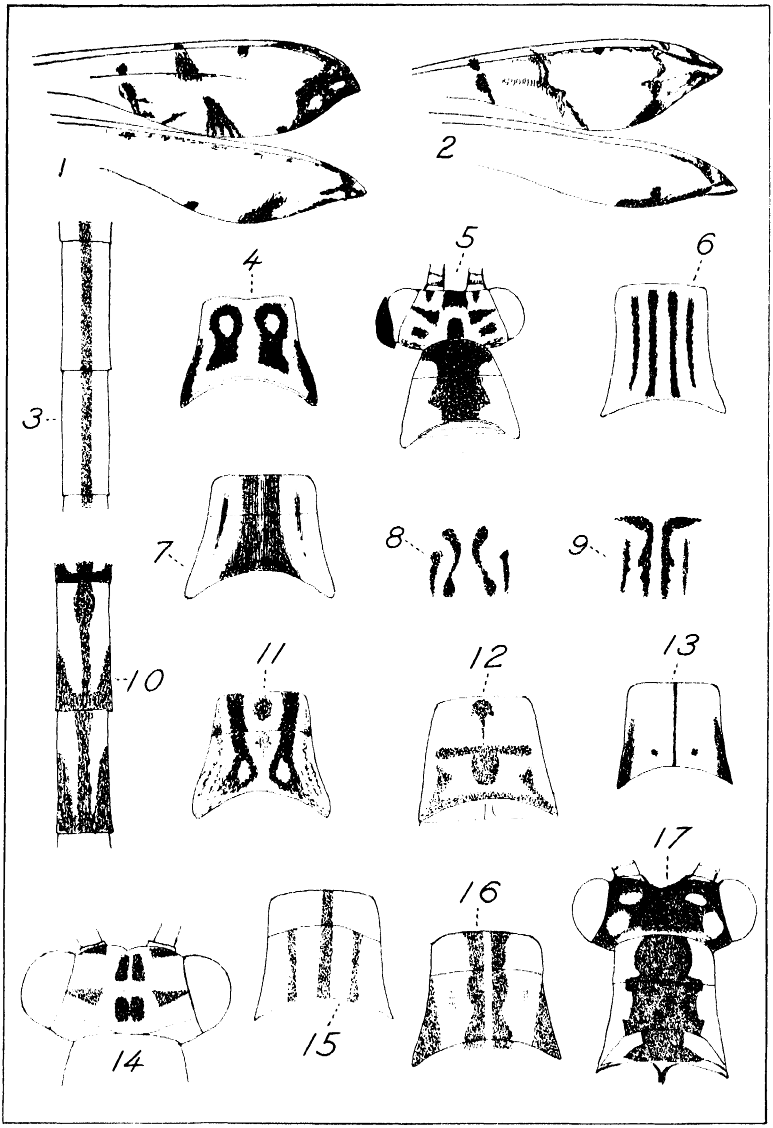
Myrmeleon pertennis Klap.

Agrees with *Nesoleon variegatus.*

I have still another species of this genus which I have not seen in any of the European collections.

Nesoleon tumidus new species.

In general marked like *N. mysteriosus* Gerst. but hardly as heavily, and the pale area in apex of wings is therefore not as prominent. The wings are as broad as in that species, and the outer margin more rounded; there is no mark up from end of anal vein; the pronotum not as slender as in *N. mysteriosus,* but with the three stripes complete; the vertex has a black cross, the front with a large black spot extending much below the antennæ and covering the front of the vertex; the thoracic marks as in *N. mysteriosus* but broader; abdomen lined on base, beyond dark; legs more heavily marked than in *N.*



African Myrmeleonidæ.

mysteriosus, the hind femora dark on outer side, and tibia with a black line within; 11 or 12 cross-veins before radial sector in each wing, 11 branches of radial sector. It differs from *N. mysteriosus* not only in lacking the pale spot below antennæ, but from this and all other species of the genus I have seen in the greatly swollen vertex, fully twice as high as in *N. mysteriosus*.

Expanse 74 mm.

From Harrar, Abyssinia (Kristensen).

EXPLANATION OF PLATE.

Fig. 1. *Cymothales eccentros*, wings.
Fig. 2. *Cymothales johnstoni*, wings.
Fig. 3. *Nesoleon pallens*, abdomen.
Fig. 4. *Myrmeleon pulverulentus*, pronotum.
Fig. 5. *Myrmeleon ochroneurus*, pronotum.
Fig. 6. *Phanoclisis longicollis*, pronotum.
Fig. 7. *Acanthaclisis distincta*, pronotum.
Fig. 8. *Creagris mortifer*, pronotal marks.
Fig. 9. *Creagris cinerascens*, pronotal marks.
Fig. 10. *Nesoleon lepidus*, abdomen.
Fig. 11. *Acanthaclisis longicornis*, pronotum.
Fig. 12. *Myrmeleon cinereus*, pronotum.
Fig. 13. *Myrmeleon infidus*, pronotum.
Fig. 14. *Myrmeleon fasciatus*, pronotum.
Fig. 15. *Myrmecælurus lætus*, pronotum.
Fig. 16. *Formicaleon diversus*, pronotum.
Fig. 17. *Myrmeleon lethifer*, pronotum.

MISCELLANEOUS NOTES.

Note on Phanæus Torrens Lec.—In 1847, in the Journ. Acad. Nat. Sci. Phila., Ser. 2, Vol. 1, p. 85, Dr. Leconte described as new *Phanæus torrens* in the following words: "Cupreus, subnitidus, subtiliter rugosus, clypeo ♂ postice breviter cornuto, thoracis disco triangulariter planato; elytris obsolete punctatis, profunde striatis, striis basi dilatatis. ♂ Long. .59; lat. .42. ♀ Long. .74; lat. .46.

"Varietatibus quibusdam P. nigrocyanei (McLeay) similis, at interstitiis elytrorum convexioribus, vix conspicue punctatis, necnon colore cupreo distinctus. Habitat ad urbem St. Louis, a Dom. Engelman datus.

"Supra læte cupreus, subtus nigro-æneus. Clypeus rotundatus,

margine elevato, lineaque elevata utrinque obliqua, ad verticem tendente; vertice in ♀ transversim elevato, in ♂ cornu brevi compresso, acuto armato; subtiliter reticulato-rugosus. Thorax apice emarginato, medio leviter producto, lateribus postice profundissime sinuatus, basi utrinque leviter obliquo, medio obtusissime angulato; angulis posticis obtusis non rotundatis, fovea antica laterali sicut in omnibus notatus; disco ♂ subtiliter scaber medio triangulariter deplanatus; angulis posticis trianguli hujus tuberculi formibus eminentibus; ♀ rugose reticulatus, postice leviter canaliculatus, antice transversim impressus, elevatusque. Elytra profunde striata, striis ♂ leviter punctatis, ♀ laevibus 2ndo 5to basi valde dilatatis; interstitiis modice convexis, obsolete sparse punctulatis."

The *nigrocyaneus* McLeay with which *torrens* is compared by Dr. Leconte is now regarded as a synonym of *igneus* McLeay.

Mr. Frederick Blanchard in 1885 (Trans. Am. Ent. Soc., XII, p. 169) cites *torrens* as a variety of *triangularis* Say, but does not give any characters by which it may be separated. Dr. Leconte in the List of the Coleoptera of North America, 1863, also cites *torrens* as a variety but in the Check Lists of Crotch and of Henshaw the name has disappeared entirely.

Having had occasion to identify a ♀ said to have been collected on June 9, 1909, in Monroe Co., Indiana, and sent to me by W. S. Blatchley, which appears to correspond with the description of *torrens*, I believe the name should be restored to our lists. Superficially this insect resembles *igneus* but, as stated by Dr. Leconte, differs not only by the distinctly coppery color of the upper surface, and the darker antennal club, but by the mere convex and scarcely punctulate elytral intervals, and the more regularly punctate thorax. On the other hand while it resembles *triangularis* in the thoracic characters and is possibly a variety of that species as stated by Leconte in 1863 and by Blanchard it differs from the specimens I have seen by its convex and smooth elytral intervals. Great variations in the elevation of the elytral intervals have been observed and that character alone may not be a safe basis for separating *torrens* but as such specimens as Mr. Blatchley's can not be placed by Blanchard's table of species the name should be cited as a species until further investigation has clearly shown its relation to *triangularis*. Certainly the name should not be lost in synonymy.—CHARLES W. LENG.

Physocnemum andreæ Hald. in the Okefinokee Swamp in Georgia.—About a mile out of Waycross, Ware Co., in southeastern Georgia, the Hebard Cypress Company have a large lumber mill in operation. The cypress logs which feed this mill are obtained from the north-western part of the Okefinokee Swamp, where the company has established a logging camp, connected with the mill by a tram road about 26 miles long.

On the 9th of May, 1911, the writer boarded one of the company's logging trains, and made the trip down to the logging camp. Here he spent the day collecting insects, and returned to Waycross that night. The swamp had been cut over for quite a distance, and collecting was confined to the cut area. Branches of the railroad had been built out into the swamp here and there, and after the cutting of the timber had been torn up again, leaving various paths from which to choose over which one might proceed dry shod. During the course of the day in sauntering along these old tracks, I took no less than four specimens of *Physocnemum andreæ*, two males and two females.

While I did not make note of the species of trees that had been cut off or remained standing in this part of the swamp, from a subsequent study of a very similar situation, five or ten miles farther south, deep within the Okefinokee Swamp, I am reasonably certain that the bulk of the trees were made up of the following species: Cypress (*Taxodium distichum* and *T. imbricarium*); black gum (*Nyssa sylvatica*); white bay (*Magnolia Virginiana*); red bay (*Gordonia lasianthus*) and sweet bay (*Persea pubescens*) with perhaps some red maples (*Acer rubrum*). It seems probable that the cypress trees are the food plant of the *Physocnemum*.

During the past summer, the writer spent seven weeks encamped in the heart of the Okefinokee Swamp, on Billy's Island. He was with a party of several other entomologists and vertebrate zoologists from Cornell University, whose purpose was to make a biological reconnaisance of the swamp. During this time, from May 28 until the middle of July, one more specimen of *Physocnemum andreæ* was captured, and it was found in a spider's web.—J. CHESTER BRADLEY.

Field Notes on Coleoptera.—*Athous acanthus* var. *maculicollis* Lec. This species was caught at Lake Hopatcong, in July or August,

by beating. The sexes differ in color, one sex only having the pale sides to the thorax which is indicated by the name.

Zeugophora varians. This species was caught at Ramsey, N. J., Labor Day, on dead chestnut saplings growing alongside a tree; it was not active, but retracted its legs as it fell in the umbrella, and acted and looked like a *Cregya oculata.*

Bassarus sulphuripennis. This species was caught at Lake Hopatcong, on leaves of oak, in July or August.—E. A. BISCHOFF.

Anthonomus scutellaris on Beach Plum.—In the last edition of "The Insects of New Jersey" the weevil *Anthonomus scutellaris* Lec. is reported without definite locality. In my collections there are three specimens from Staten Island, identified by Mr. Charles W. Leng; a pair found in copulation on May 7, and a female found on a beach plum bush near the shore at Richmond Valley. The species is not mentioned in Ulke's District of Columbia list, nor in that of Charles Dury of the beetles occurring near Cincinnati, Ohio.—WM. T. DAVIS.

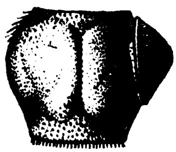
Dytiscus flying in January.—As an illustration of the mild temperature we have had this winter, it may be worthy of mention that a specimen of *Dytiscus verticalis* ♂ was caught flying in my garden about 5 P. M. on January 17, by my son.—C. W. LENG.

Periodical Cicada (Tibicen septendecim Linn.).—The appearance of a large brood of this insect in 1911 aroused much interest, and as an indirect outcome, we received from Prof. G. A. Bailey, June 11, 1912, a report that he had found several nymphs of this insect emerging from the ground on Major Wadsworth's estate at Geneseo. Subsequently adults were forwarded and there can be no question as to the identity of the insect. Prof. Bailey states that the few observed occurred within a narrow radius in a piece of second growth timber. There is a record of a colony of brood 12, the one which appeared in such large numbers in the Hudson valley in 1911, in the northern part of Pennsylvania and not so very distant from Geneseo. Should the insects noted above belong to this brood they must be considered as stragglers, otherwise it is necessary to associate them with brood three, no colony of which has been recorded nearer New York state than central-western Ohio and the northern portion of West Virginia.

This seems to be a weak colony, since we have been unable to obtain any information respecting the earlier appearance of the insect in that section.

The occurrence of belated individuals is amply substantiated by records kindly placed at our disposal by Mr. W. T. Davis, New Brighton, S. I., who found periodical cicadas on Staten Island in 1895 and again in 1912. They were likewise found the past season by Mr. Davis at West Point. In all cases they were undoubtedly belated individuals from the brood which appeared in such large numbers in 1894 and 1911. Mr. Davis has also collected specimens of this brood in 1893 and 1910, one year in advance of the normal time for emergence. Mr. Henry D. Lewis, of Annandale, informs us that no belated individuals were observed by him in 1912, though he had seen them following earlier appearances of this insect.—E. P. FELT.

Nature's Surgery.—A specimen of *Chlænius leucoscelis* Say was received through the kindness of Dr. R. M. Moore, of Rochester, who considered it might be of interest to the teratologist. An examination discloses an interesting condition. One side of the thorax was cracked almost to the median line and an apparently supernumerary piece on looked very much as though a bird might have pecked at the beetle, partly fractured the thorax and one margin had been reversed so that the normal impressed outer margin was next the median line, the ragged, broken fracture being external. It



held to a small piece until the insect, in its struggles to escape, might have reversed its position with a resulting dislocation of the fragment of the sclerite. The contraction of the muscles apparently held the piece in this abnormal position until healing of the wounded tissues fastened it securely in place.—E. P. FELT.

Iphiclides ajax Linnæus on Long Island and Catopsilia philea Linnæus in New York City.—On the morning of June 25, 1912, a specimen of *Iphiclides ajax* was seen flying northward following the shore at Brighton Beach, L. I. Collectors of long experience report this species as not uncommon formerly in the vicinity of Brooklyn, but of late years it has been scarce, the one noted being the first record observed by the writer on Long Island, where, in the absence

of its foodplant "paw-paw," the species must be considered as a visitant.

The record of *Catopsilia philea* is more unusual. Neither Mr. Beutenmueller, in his list of "Insects found within fifty miles of New York City," nor Prof. Smith in his report "The Insects of New Jersey" include the species. A specimen was seen on October 13, in Riverside Park, opp. 110th Street, New York City. The large size and the orange tint on the secondaries plainly seen as it passed within a few feet, left no doubt as to the identity of the butterfly. The presence of the Atlantic fleet of U. S. batleships assembled in the Hudson River at the time suggests one way by which the insect may have reached this northern zone.

Pamphila ethlius Cramer, recorded as common and even destructive to its foodplant (*Canna*) from several localities of Long Island during the season of 1911 failed to appear again during the present year. Observations from other collectors concerning the distribution of this species in 1912 would be of interest.—GEO. P. ENGELHARDT.

Distribution of Argynnis atlantis and aphrodite.—A statement, apparently copied from Scudder, to the effect that *aphrodite* was not found in the heart of the White Mountains is incorrect; the following are personal records:

Glen House, N. H., July 16–23, 1906:
Argynnis atlantis, abundant
Argynnis aphrodite, fairly common.

Jefferson Highlands, N. H., August 5-11, 1907:
Argynnis atlantis, abundant,
Argynnis aphrodite, fairly common.

Crawford House, N. H., Aug. 14, 1905; July 24, 1910:
Argynnis atlantis,
Argynnis aphrodite.

Sugar Hill, N. H., July 23–Aug. 7, 1904:
Argynnis atlantis, none.
Argynnis aphrodite, abundant.

The difference in size between the sexes increases northward, the northern males being smaller than the females.—GAYLORD C. HALL.

Neuronia pardalis Walker near New York City.—As a contribution to faunistics it would seem to be desirable to place on record one of the largest and most beautiful of the Trichoptera as occurring within our local bounds. An examination of the last edition of Professor Smith's List of the Insects of New Jersey indicates that he was not aware that *Neuronia pardalis* Walker had a place among the insects of that state, nor have I found it recorded from this neighborhood in New York. It was my good fortune while sweeping the roadside herbage at Lakehurst, New Jersey, at dusk on the 5th of June, 1909, to find in my bag a perfect adult specimen of this caddis-fly. Another specimen now in the collection of Mr. William T. Davis, of Staten Island, bears a label attesting its capture by Mr. Frank E. Watson near Ramapo, New York, on June 7, 1908. So far as I have been able to learn these are the only two instances of the taking of this insect within our local limits.—LEWIS B. WOODRUFF.

PROCEEDINGS OF THE NEW YORK ENTOMOLOGICAL SOCIETY.

MEETING OF JANUARY 21.

A regular meeting of the New York Entomological Society was held January 21, 1913, at 8:15 P. M., in the American Museum of Natural History, Vice-President Chas. L. Pollard in the chair, with seventeen members and three visitors present.

The curator reported the receipt of important donations to the local collection including 169 Neuropteroids, representing 142 species, obtained from Nathan Banks, making that part of the collection 80 per cent. perfect; and a collection of Thysanoptera obtained from J. Douglass Hood.

The vice-president then opened the Symposium on Insects of Mesophytic Environment.

Dr. Lutz, speaking of the environment itself, said that it might be regarded as the climax of the evolution of environment, represented in forests of oak-chestnut-beech and in meadows rich in clovers, which forests and meadows must by the laws of plants result from natural processes. The question was, however, if it could be shown that insects followed the same laws.

Mr. Leng, speaking of the beetles of Mesophytic Environment, expressed the opinion that food for beetles constituted a more important factor than moisture, and a wish that this, being recognized, might lead to a more general use of pin labels recording food plants and habits.

Mr. Harris said that the Cicindelidæ being predaceous in all stages would exhibit no direct relation with plants. He also referred to the color differences of *C. consentanea* and *patruela* and later of *C. modesta* and *rugifrons*.

Mr. Dow spoke of the color differences in *C. santa-claræ* and *C. anita* and said the darker form preponderated in August.

The subject was discussed by Messrs. Schaeffer, Davis, J. W. Angell, Leng and Dr. Lutz, the latter pointing out that the great influence on pigmentation of differences in temperature and humidity was well established, especially when applied to pupa or imago just after emergence.

Dr. Lutz, referring to the bearing of food on environment, said that while it was manifest that no insect could exist without food, the question was why their distribution was not coëxtensive with that of the food. Parasites had been suggested as a possible explanation, but the bearing of a multiplicity of other restraining factors remained to be investigated. He pointed out that the societies of aquatic insects already shown to exist clearly proved that food could not be regarded in all cases as the prime factor.

Mr. G. W. J. Angell referred to the paucity of Chrysomelidæ in the Hawaiian Islands.

Mr. Dow and the vice-president discussing this subject brought out that in some families the flora was largely imported.

Messrs. Harris, Schaeffer and Davis discussing the Cicindela color question further brought out that green forms (*rugifrons*) occurred at the eastern end of Long Island, while the black form represented usually by spotted examples (*modesta*) was found at the western end, with an occasional immaculate specimen resembling the *nigrior* of Alabama, etc. It was suggested after the meeting closed that the two colors might have originated through the influence of temperature and humidity operating in different regions on branches of the original stock, and the present occurrence in the same region of the descendants of the two forms be the result of subsequent dispersal and overlapping territory.

Mr. Barber said that many Hemiptera being plant feeders are necessarily restricted to the distribution acquired by the food plant, but as in the Coleoptera they frequently fail to follow the food plant throughout its range.

Mr. Davis said that of the 154 Orthoptera found in New Jersey 125 might be classed as mesophytic; they were as a rule general feeders, some attacking conifers only but for the most part incapable of classification by food. Some, on the other hand, are confined to a certain physical environment as that of the beach, and such would be found on similar white sand back from the shore.

Dr. Lutz pointed out that the preponderance of species of insects in mesophytic environment was in keeping with the preponderance of mesophytic plants, which in number of species far exceeded that of other environments.

Mr. Grossbeck said that Lepidoptera were so absolutely tied to their food plants that no useful facts could be drawn from them.

Mr. Engelhardt said that moisture might in certain cases be as injurious to insects as it was beneficial to plants. Commenting on the great value of food plant labels he instanced the rare Sesiide, *Albuma pyramidalis* var.

coloradensis, described from Colorado, found by Mr. Schaeffer on Long Island, and by himself in Newfoundland, and said that were the food plant known a species of such wide range might be more often caught.

Mr. Schaeffer said that the food plants east and west often differed and the vice-president remarked that even where the food plant was plentiful the insect might remain rare.

Mr. Leng, replying to the criticisms of Dr. Lutz, said that he was anxious to simplify the environment question as much as possible to the end if possible of creating a strong feeling in favor of environmental labels; that unknown factors undoubtedly operated in restraint of the food factor, but the investigation of such should not be allowed to retard the useful work of recording food habits.

Mr. Dickerson said that he desired to emphasize the importance of such records of food habits and hibernation habits from an economic standpoint. He said that the plum curculio for instance and the sweet potato flea beetle could be attacked more successfully were their hibernating habits known. Economic entomologists depended largely upon the original work of collectors for such information, and he desired to indorse strongly the super-importance of recording all facts observed in the field bearing on food or shelter.

MEETING OF FEBRUARY 4.

A regular meeting of the New York Entomological Society was held February 4, 1913, at 8:15 P. M., in the American Museum of Natural History, President Dr. Raymond C. Osburn in the chair, with sixteen members and four visitors present.

The curator reported the addition to the local collection of a notable number of scale insects, representing 75 of the 88 species named in Smith's List of New Jersey Insects.

The president re-appointed Messrs. Grossbeck and Engelhardt as field committee, designating Mr. Grossbeck as chairman at Mr. Engelhardt's request. For the field committee, Mr. Grossbeck gave notice of a field meeting on February 22, at the old iron ore mines on Staten Island, under the guidance of Messrs. Davis and Leng; sifting under cover, if necessary on account of weather, being the feature of the programme.

Mr. Schaeffer spoke on Temnochilidæ, exhibiting a portion of his collection. At the outset he expressed himself as strongly in favor of the law of priority, disclaiming responsibility for the published vote by which he was made to appear as being opposed thereto. Nevertheless, he was disposed to proceed slowly in adopting the alleged earlier name Ostomidæ for the family. Speaking then of the different tribes, genera and species, Mr. Schaeffer said that many of the species seemed to be of comparatively recent origin and possibly still in process of evolution, leading to some difficulty in fixing the limits of what should be regarded as individual variation. The resulting difficulty in constructing satisfactory synoptic tables of the differences between the species was increased by the decisive characters being often more accentu-

ated in the males, so that it became sometimes impossible to place unique females, of which several remained unnamed in his collection. As Mr. Schaeffer's results will later be published in full in the Bulletin of the Brooklyn Institute, it is only necessary here to refer to his complete revision of the genus *Temnochila* (formerly *Trogosita*) in which the variety *nyenta*, named by Mr. Dow in honor of our Society, becomes raised to specific rank; and the differences in structure, color, punctuation, etc., observed in the forms occurring in our different faunal regions are minutely described. In closing, Mr. Schaeffer spoke briefly of the Ostomini and said the species *Ostoma oblonga* and *grossa* should undoubtedly be stricken from our lists, the records upon which they had originally been included being unreliable.

Discussing Mr. Schaeffer's remarks on the law of priority, Mr. Leng said it seemed to him that the law which protected the specific name *virescens* and the generic name *Temnochila* because they were the first to be applied, should, in consistency, be invoked to protect the family name Trogositidæ because it in turn was the first to be applied as a name for the family; and he added that he believed the greatest opposition to the strict application of the law of priority came from those who, like Prof. Bradley, of Cornell, felt obliged to protest against such changes in established family names, though they were in sympathy with the law in other respects.

Mr. Schaeffer replied that it was customary to make family and tribal names derivatives of the oldest generic name contained therein, whereby they necessarily changed when the discovery of the prior description of the genus necessitated a change in its name; moreover, a desirable accordance with European practise was thereby attained. However, he admitted that Trogositidæ was in fact the first name to be applied to the family in question.

Mr. Dow exhibited a collection of the genus *Dynastes*, calling attention to a new form from Prescott, Ariz., differing from *grantii* and *tityus* in having the cephalic horn simple like *tityus* and the thoracic horn forked like *grantii*, and added that an examination of over 300 specimens failed to show any intergrading forms.

Mr. Schaeffer said that variations of this nature were not unusual in Dynastini, and had not been regarded as worthy of names heretofore. Differences even greater had been simply referred to as ♂ major and ♂ minor.

Mr. Dow spoke of the environment and adaptations of Temnochilidæ, giving also some interesting facts as to derivation of specific names in this family. Thus the first specimens being discovered in a cargo of grain from Morocco led to the specific name *mauretanica* and the generic name *Trogosita* meaning "gnawer of grain" though we know now that grain-eating larvæ constitute the actual food. Later Mr. Dow quoted Chittenden as authority for a statement that such carnivorous larvæ could in a case of necessity subsist on the grain itself. The name *virescens* also Mr. Dow said had no connection with color, but referred to the long sparse setæ of the mentum suggesting to the author the first growth of hair on the adolescent human chin. In respect of habits, Mr. Dow divided the family into three groups, the first semi-cylindrical in form, adapted to enter burrows, to feel their way in

the darkness of such by their setæ, and to maintain fierce combat with the owner of the burrow by means of powerful mandibles, as when bulldog meets woodchuck. He also pointed out the concealment of sensitive parts like antennæ, and the concurrence of seasonal appearance with that of the prey. The second group becomes flattened in form and has the same protection for eyes and antennæ. The larvæ are provided with a terminal hook which can be erected in a threatening manner like the tail of Staphylinidæ, but is equally harmless and possibly useful in retrograde movements. Ants are sometimes dangerous to such larvæ and their extreme flatness, enabling them to enter minute crevices, aids them in escaping such enemies as well as in finding food. Mr. Dow expressed his sympathy with the labor undergone by such insects and Cleridæ in finding their food, which is mainly scolytid larvæ, for he pointed out the woody tissue passing through such larvæ blocks the tunnel more or less making a long hard job for the Temnochilid larva to earn his dinner. He also referred to the similarity in size, not more than 5 per cent. difference in waist measurement being observed. Eventually also the supply of scolytid larvæ is exhausted and the Temnochilid adults must "treck or starve, that's what make 'em leave home" in Mr. Dow's opinion. The third group consists of forms which apparently subsist on fungus. These mimic certain Tenebrionidæ and have similar distribution. Mr. Dow gave details of his investigation of the tunnels made by *Diaperis hydni* and *Thymalus fulgidus* larvæ, and stated that the tunnels made by the two insects never met, so that there was no possibility of the latter devouring the former.

His remarks were discussed by Messrs. Comstock and Schaeffer.

Mr. Comstock exhibited *Thecla wittfeldi* and mentioned each specimen known to him, and the Floridian locality from which it came. His paper will be printed elsewhere in full.

Mr. Davis in reply to a question said the three specimens caught by him were taken in upland oak lands, comparatively dry places, but near Lake Hollingsworth and Lake Parker, at Lakeland, Fla., May 6.

He also pointed out that another specimen was in Mrs. Slosson's collection raised from a full-grown caterpillar.

Mr. Grossbeck said he was not confident that all the specimens enumerated were identical with the type, there being a marked difference in size as well as in the bands of color. It was true that the color character was known to vary in all allied species, *T. calamus,* but not the size as well.

Mr. Davis recorded the occurrence of *Anthonomus scutellaris* on Staten Island May 7 and 25, on beach plum.

Mr. Schaeffer said it had been found on Long Island and at Lakehurst, but that the food plant had not been previously recorded.*

Mr. Davis exhibited two boxes of *Catocala* caught in Florida embracing the species *ilia* and *micronympha* found at LaBelle and *amica* and *coccinata*

* During the reading of these minutes it was stated that this species had been found on flowers and on scrub oak, probably accidental occurrences, its actual food plant being beach plum.

var. *sinuosa* found at Lakeland, and commented on the large numbers in which some of them occurred on oak trees at LaBelle, sometimes three being caught at once. The *C. micronympha* especially mimic the bark on which they rest so perfectly that it was necessary to pass a stick up and down the bark to avoid the risk of overlooking some.

Mr. Grossbeck, commenting further at Mr. Davis's request, pointed out the interesting and rare varieties included in Mr. Davis's collection, such as var. *gisela* of which only two specimens were in the Museum Collection, and var. *sinuosa* of which only two or three were in existence in all collections.

Mr. Grossbeck recorded the observation of *Euvanessa antiopa* in flocks of a dozen to twenty, flying in a northerly direction from the outlying islands to Freeport, L. I., on October 3, 1912, by Mr. H. Thurston. It was conservatively estimated that 500 specimens were thus seen migrating.

MEETING OF FEBRUARY 18.

A regular meeting of the New York Entomological Society was held February 18, 1913, at 8:15 P. M., in The American Museum of Natural History, President Dr. Raymond C. Osburn in the chair, with twenty-four members and two visitors, Dr. Frederick A. Lucas, director of the American Museum, and Dr. William Barnes, present.

Dr. William Barnes, Decatur, Ill., was nominated for active membership by Mr. Davis.

On motion the by-laws were suspended and Dr. Barnes was immediately elected.

Mr. C. H. Roberts read a paper entitled "Critical Notes on the Species of Haliplidæ of America north of Mexico with Descriptions of New Species" and exhibited his collection. As this paper will be printed in full in the JOURNAL, no abstract is given here.

The paper was discussed by Messrs. Weeks, Schaeffer, Sherman and Leng, the latter pointing out that while the genus *Cnemidotus* was properly described by Erichson in 1832, the name itself had been proposed in 1802 for a species of *Haliplus*, becoming thereby a synonym, so that the substitution of *Peltodytes* by Regimbart in 1878 was a proper course.

The president opened the Symposium on Insects of Carrion and Excrement by general remarks, tracing particularly the possible origin of the habit.

Mr. Leng read a paper on "Beetles of Carrion and Excrement," in which he pointed out that while beetles like *Silpha* are confined to carrion, beetles like *Canthon* to excrement, and beetles like *Necrobia* to predaceous attacks upon other insects attracted by carrion and excrement, there were besides many beetles in which the habit was less exclusively developed until finally the boundary became vague. He referred also to the factors controlling the distribution of such insects, particularly the adaptability of some genera like *Cercyon*, leading to their wide distribution.

Mr. Weeks spoke of the Staphylinidæ frequenting excrement with predaceous designs, stating that he had seen them jumping at flies. He spoke also

of the theft by a female *Canthon* of a ball prepared and rolled some distance by another pair; and of the similar balls occasionally made by *Phanæus*.

This subject was further discussed by Mr. Davis, who referred to the depth of the holes made by *Copris*, reaching 24 inches at times, but varying with the character of the soil; and the fact that chance often determines the location of the hole, as he had seen the imprint of a pig's foot turned to account. He said it was evident that the material of the ball was all the *Canthon* larva had to eat, for the balls were often a distance from the manure.

Mr. Bischoff speaking of the balls made by *Phanæus carnifex* said that no ball was made when the ground beneath the excrement was suitable for digging, but when it was rocky or very hard the beetles formed the ball and rolled it to softer ground.

Mr. Dow said his first *Necrophorus vespilloides* was caught burying the butterfly *Vanessa antiopa*.

Mr. Angell speaking of *Deltochilum* said that it was apparently not always attracted by excrement, as Brownwell had written him of finding it at night about small trapped mammals at Cape Sable, Fla.

Mr. Schaeffer spoke of *Geotrupes chalybæus* having been attracted in Florida by stale urine.

Mr. Davis referred to his article on "Owl Pellets and Insects" in Vol. XVII of our JOURNAL (June, 1909) in which the capture of *Trox erinaceus* and *T. seaber* attracted by the hair contained in the pellets is mentioned.

Mr. Shoemaker spoke of *Phanæus carnifex* observed rolling balls in Maryland.

Mr. Barber, speaking of the Hemiptera of Carrion and Excrement, said that instances of their occurrence in such environment were rare, though some were certainly fungus feeders; the observation by Mr. Engelhardt of *Corynocoris typhæus* in a dead turtle being a remarkable exception. Bedbugs have also been found on dead animal matter.

Mr. Davis said he had found *Apiomerus crassipes* three times on manure piles and thought it was waiting for insects to come within its reach.

Mr. Weeks added that the predaceous Reduviidæ were often found in such situations.

Dr. Osburn said he knew of no dragon flies or stone flies attracted by excrement or carrion; and that such matters seemed to be avoided by primitive insects.

Mr. Sleight said the Trichoptera would be found on decaying vegetable matter but not in manure.

Mr. Dickerson called attention to page 34 of Smith's List, in which the occurrence of spring-tails (Collembola) in manure beds is recorded.

Dr. Barnes speaking of Lepidoptera said that no instances of larvæ living in excrement or carrion could be cited, but that such matters often attracted imagos. He mentioned *Papilio indra* seen in Colorado about a buried dead mule, and *Argynnis meadii* in Idaho on dead sheep; besides frequent occurrences on decayed fruit.

Mr. Grossbeck added that the species of *Euvanessa, Vanessa* and *Grapta* are frequently seen in orchards about piles of decaying vegetable matter. He also mentioned *Basilarchia ursula* as common on manure, and the finding of eight *Thyris lugubris* on a dead snake at Lakehurst.

Mr. Shoemaker mentioned finding *Basilarchia proserpine* on a dead woodchuck.

Mr. Woodruff said he had seen *Thyris lugubris* on a dead snake and a dozen at once on human excrement.

Mr. Olsen also mentioned the occurrence of diurnal Lepidoptera on dead snakes, and Mr. Franck said the imagos of Lepidoptera were often attracted by decaying matter.

Mr. Schaeffer added that he had found their larvæ in decaying cactus.

Mr. Davis said that Tineid moths, feeding upon garments of wool and hair, must be considered among carrion feeders, like *Trox* among beetles. He cited *Trichophaga tapetzella*[1] which he had found on owl pellets containing much hair, and whose work therein is more fully described in Proc. S. I. Ass. A. and S., I, p. 85, 1906.

Dr. Osburn then spoke of the Diptera, in which the families Sarcophagidæ, Scatophagidæ, and Muscidæ are largely scavengers, as well as many Syrphidæ and scattered species in other families. *Volucella* for instance, feeding on bees that die in the nest and *Microdon tristis,* inquilinous in ants' nests. Species feeding directly on excrement are *Syritta pipiens* and *Eristalis tenax,* the latter following privy vaults around the world. The transition from feeding upon decaying vegetable matter to excrementitious matter is readily traced in Diptera.

Mr. Dickerson spoke of tracing flies which were troublesome in spotting peonies at Fairlawn, N. J., to a foul mass of skin and hair about three fields back in which thousands of flies and maggots and many *Trox* were found.

Dr. Osburn speaking of ants said that a tiny red ant common in Tortugas devoured dead insects with such speed that insects left exposed for an hour were entirely eaten; and they were made even useful in cleaning skeletons. He described the long lines of these ants proceeding from the nests.

Mr. Davis said the tiny red ant was very likely *Monomorium pharaonis* Linn. often found in houses in warm regions, a cosmopolitan species which he had found even in New York City.

Mr. Woodruff recorded the occurrence of the caddis fly *Neuronia pardalis* at Lakehurst and Ramapo, the latter being a capture by Frank E. Watson, now in Mr. Davis's collection.

Dr. Barnes, upon invitation, spoke of his collection of Lepidoptera, saying that his effort for thirty-five years had been to have specimens compared with the type, labeled to show location of type, type locality, where description could be found and food plant, so as to avoid frequent unnecessary reference to literature. About 1,000 to 1,200 actual types have been accumulated, and

[1] This name is erroneously printed *tapetiella* in Smith's List of the Insects of New Jersey, p. 574.

accessions of 50,000 specimens were made this year. Dr. Barnes deplored the occasional lack of harmony among the workers in Lepidoptera, giving some instances from his own experiences.

The subject of sectional cases for large growing collections was discussed by Dr. Barnes and Messrs. Schaeffer, Davis, Angell and Engelhardt.

MEETING OF MARCH 4.

A regular meeting of the New York Entomological Society was held March 4, 1913, at 8:15 P. M., in the American Museum of Natural History, Mr. G. W. J. Angell, the Society's first president, in the chair in the absence of the president and vice-president, and 20 members present.

The curator reported that the local collection of Lepidoptera is now 95 per cent. perfect in Rhopalocera, 100 per cent. in Sphingidæ and Saturnidæ and 91 per cent. perfect in Geometridæ, and that the spiders of the local collection include about 60 per cent. of the 324 believed to occur within 50 miles of New York City, and that with the coöperation of Mr. J. H. Emerton it would be further enlarged. He spoke of the ease with which members not personally interested in spiders could collect them in the field by putting in alcohol and Mr. Emerton's willingness to name such captures.

The field committee reported a successful outing on February 22 at Staten Island, in which ten members and four visitors participated in sifting.

Mr. Engelhardt spoke on "Lepidoptera from Newfoundland and Labrador, collected in July and August, 1912," describing the localities visited, showing their character by geological map and photographs thrown on the screen by the radiopticon, and exhibiting specimens of the species obtained, a list of which will be published later. Mr. Engelhardt emphasized the facts that at Port aux Basques exceedingly boreal conditions were encountered, foggy, misty weather, much bog and bare granitic rock; all exposed to strong sea gales; while 10 miles further north, passing the natural barrier of the Cape Ray Mountains, a complete change occurred with extensive sand dunes and carboniferous rocks supporting a vigorous vegetation. Between these two stations nearly all the species of the west coast would be found, making the expense of further travel unnecessary, though the more inland Codroy region would probably repay investigation, and the Lepidoptera of the east coast would also eventually require attention. He frequently referred to the journey having been made too late in the season, stating that the Newfoundland season for Lepidoptera probably opened June 15, and the following four weeks up to July 15 would prove the best collecting, owing to the rapid development of northern insects. The species peculiar to Newfoundland and the more desirable species, generally speaking, were found in the barren and boggy regions, though the greatest number of specimens, in Noctuidæ especially, came from Spruce Brook, 50 miles inland and comparatively fertile and well wooded, the species represented being, however, more akin to those well known from New England. Speaking of particular species Mr. Engelhardt called attention to the variety *canadensis* of *Papilio glaucus*, of which

larvæ were found on alder, birch, bird cherry and willow, but more often the former; *Papilio brevicauda,* difficult to catch on account of its flying about Epilobium flowers, growing among tangled debris of forest fires; many larvæ of this species were, however, found in August on wild parsnip and about 30 pupæ are now on hand; *Brenthis myrina, Phyciodes tharos, Aglais milberti,* and other species were remarkable by the form or color exhibited; *Œneis jutta* was found only in the bogs and was hard to catch, as the treacherous surface made running impossible; also this species would light on lichen-covered trees where its protective coloring made it nearly invisible. The Newfoundland form of this species varies greatly from that found in British Columbia, and seems worthy of a varietal name. *Rusticus aster,* a species peculiar to Newfoundland, and sufficiently rare to be missing in the Museum collections of New York, Brooklyn and Washington, was represented by ♂ caught July 15 and ♀ August 10.

Agriades aquilo, a little blue butterfly, confined to subarctic regions, was found on Caribou Island, Battle Harbor, Labrador, clinging to lichen-covered rocks, taking to flight suddenly upon the appearance of sunshine, often flattened against the rocks by the wind, and leading apparently a precarious life for so delicate an insect. 24 diurnals in all were taken and indicate that the fauna is principally an extension from the northern temperate zone, in some instances from British Columbia right across the continent, with a tendency towards a darkening of the colors probably influenced by the moist climate. After commenting upon the Sphingidæ, Noctuidæ, Sesiidæ and Geometridæ, in which the same relationship and tendency to change in coloration were noted, and pointing out that Geometers could be found in bad weather clinging to the sheltered side of overhanging rocks, on tree trunks, etc., by careful inspection; that the boggy tops of the mountains yielded mainly the same insects as the lowland bogs; and the difficulties in moving about freely in search of Lepidoptera caused by the absence of roads, the impenetrable thickets, the nature of the bogs and the swarms of black flies.

Mr. Engelhardt closed by stating that the Labrador collection was too small to warrant drawing any conclusions, especially in the absence of a representation of the fauna of northern Newfoundland; and that while 150 species of Newfoundland Lepidoptera were shown, he believed it would be possible to collect 500 to 600 species by working from June 15 to October 1, in the varied environments afforded by the Island.

Mr. Grossbeck exhibited the Lepidoptera collected by Mr. Leng on the same journey, and called attention especially to three Geometers, *Hydriomena 5-fasciata* and *grandis* and *Petrophora pontiaria,* as common in the northwest but not previously known to occur east of Alberta; also a *Carsia* suffused with pale carmine apparently new unless identical with *labradorensis.* He also pointed out the small size of *Nephelodes minians* collected at Spruce Brook, and the dark hind wings of the *Heliophila luteopallens,* a character which chiefly distinguishes the western species *oxygale.* *Trichodezia albovittata* was another abnormal form, the oblique white band being almost twice as broad as in normal *albovittata* and two anterior lines strongly marked; and

Alcis guttata Hulst, Bay of Islands, Nfld., July 21, was the fourth specimen of the species thus far known; the two types came from Pennsylvania and New Jersey, a third specimen was caught at Ottawa.

Mr. Grossbeck also alluded to the close relation between certain Newfoundland and European forms as *Noctua baja* of Europe and *smithii* of America which Hampson claims are alike; *Pamphila palæmon; Mesoleuca truncata* approaching closely *M. immanata*, etc.

Mr. Leng referring to Mr. Engelhardt's account of the west coast of Newfoundland said that Birchy Cove on Bay of Islands would probably prove better than Humbermouth; and that the Blomidon Mountains at the entrance to Bay of Islands, reaching an elevation of 2,150 feet, and attainable for collecting purposes via York Harbor, as well as St. Anthony on the east coast, should both be investigated before an effective comparison between the fauna of Newfoundland and Labrador could be made.

Mr. Hall spoke of Distribution of *Argynnis* (see Short Notes).

Mr. Grossbeck exhibited a number of caterpillars blown by Mr. Mattis, which were commented upon by Messrs. Davis, Lutz, Southwick and Engelhardt, especially in reference to the admirable preservation of the natural color. Mr. Engelhardt also described the methods he used.

Mr. Woodruff recorded an extension of the known range of the Deltoid moth *Bomolocha atomaria* described from Volga, So. Dak., and found by him at Litchfield, Conn.

MEETING OF MARCH 18.

A regular meeting of the New York Entomological Society was held March 18, 1913, at 8:15 P. M., in the American Museum of Natural History, President Dr. Raymond C. Osburn in the chair, with 19 members present.

The curator reported a donation from J. H. Emerton of 80 species of spiders.

Mr. H. H. Brehme, of Newark, N. J., was nominated for active membership by Mr. Grossbeck, seconded by Mr. Davis.

On motion the by-laws were suspended and the secretary instructed to cast an affirmative ballot, electing Mr. Brehme.

The president opened the Symposium on Parasitism and Symbiosis in Insects.

Mr. Comstock, after referring to the general treatment of the subject by Folsom, gave a list of local Rhopalocera and their recorded hymenopterous and dipterous parasites with numerous additions from his own and Mr. Watson's collection. Mr. Comstock described the emergence of various parasites, and spoke of other difficulties in raising larvæ, disease, cannibalism, attacks of Hemiptera and other predaceous creatures. Passing to *Feniseca tarquinius* of which the larva is predatory on woolly plant lice, he said the eggs were laid on alder stems within an inch or two of the groups of lice, the young larvæ crawling along the stem to them and, being covered with long hair, soon resembling the lice from the exudations with which they became covered.

The larvæ of Lycænidæ were also referred to, living often with ants; they can, however, be bred without ants.

Mr. Leng read a paper on "Parasitism in Beetles," mentioning a number of instances of parasitism in different degrees and pointing out that it was a development of the food habit. He exhibited some of the beetles referred to.

Mr. Davis exhibited a *Gordius* worm 28 inches long that had emerged from a water beetle, *Dytiscus harrisii,* and specimens of *Coscinoptera dominicana,* and the pupa cases from which they had emerged, the pupæ having been found in ants' nests at Newfoundland, N. J.

Dr. Lutz spoke of F. W. L. Sladen's "The Humble Bee, etc.," recently published, and the account there given of *Psithyrus* killing the Bombus queen and securing adoption by *Bombus* workers and their assistance in bringing up the parasite's brood; as well as the complete account of Bombus parasites in the fourth chapter.

Dr. Lutz also referred to the notes on the "Biology of *Chelonus texanus,*" by Pierce and Holloway in the Journal Econ. Ent., V, Dec., 1912, in which is told how the adult Chelonus deposits its eggs in the eggs of its host, but the parasite emerges not from the egg, but from the pupa developed therefrom; and to "The Life History of *Tetrastichus asparagi,*" by Russell and Johnston, in the same journal, in which it is shown that the adult Tetrastichus oviposits in the egg of the host, the parasitic larva lives in the larva of the host and the parasite pupates within the pupa of the host. He spoke in this connection of Silvestri's "Biologia del *Litomastix truncatellus,*" a parasite which also oviposits in the egg of the host, but is polyembryonic and possibly pædogenetic in alternate generations. Continuing Dr. Lutz mentioned and discussed the recent paper by Vernon L. Kellogg in The American Naturalist, XLVII, March, 1913, on "Distribution and Species Forming of Ectoparasites," in which the interesting fact is brought out that related species of birds may be infested by the same species of Mallophaga presumably because the environment for the parasites, *i. e.,* the body of the bird, has remained unchanged while that of the hosts has not.

Mr. Angell added to the Coleopterous inquilines mentioned by Mr. Leng the five species (3 Scarabaeidæ, 1 Hisler, 1 Staphylinid) found in gopher holes in Florida.

Mr. Grossbeck exhibited specimens of *Tinea vastella,* a moth living in antlers of living deer, *Galleria mellonella,* the wax moth or honey moth and *Euclemensia bassettella,* whose larva feeds on gravid females of *Kermes,* and read a paper on parasitic Lepidoptera, in which the recorded information was summarized. *Epipyrops anomala* feeding on Fulgorids; *Bradypodicola hahneli,* the sloth parasite, feeding on hair of living sloth (*Cryptoses cholæpi*), seen flying from the sloth as it fell to the ground as described by Dyar, *Chalcoëla iphitalis,* destroying the larvæ of *Apis* and *Polistes,* were mentioned, as well as the symbiosis or trophobiosis between Lycænid caterpillars and ants. Mr. Grossbeck closed with a reference to a Lycænid from India tending aphids for the honey secreted and caressing them with the forelegs.

Mr. Comstock spoke of the development of the forelegs noticed by De

Niceville in Malayan genera *Geridus*, *Alotinus*, etc., presumably for the purpose named by Mr. Grossbeck.

Mr. Davis exhibited a number of specimens from his collection illustrating parasitism and allied subjects, among which were *Cordyceps ravenelii*, a remarkable fungus on beetle larva; larvæ of Diptera found on land turtles in positions back of the neck or back of the legs where the host cannot dislodge them, making a hole in some cases as large as an English walnut and causing the death of the turtle from exhaustion, in other cases falling to the ground to pupate and leaving the turtle as good as ever; also three species of *Cuterebra* infesting rabbits; dipterous larvæ from the ear of a red-shouldered hawk; and *Gordius* worm from *Hemileuca* caterpillar.

Mr. Dickerson spoke of the little parasites less than $\frac{1}{32}$ inch long in cottony maple scale, exhibiting two forms known by different names, *Coccophagus flavo-scutellum*, the summer brood, and *Coccophagus lecanii* in hibernating scales, but possibly identical. He said also that while the Cynipidæ usually made galls, one species was known to be parasitic on cabbage maggot and supplied a further instance of eggs laid in host eggs. He referred also to the immense numbers in which parasites sometimes occurred in nature, for instance, the fall army worm might be 99 per cent. parasitized causing it to be almost missing the following year, and *Scolia dubia*, the wasp parasite of white grubs, had been seen in large numbers flying over a lawn at Hammonton, N. J., VIII, 27.

Dr. Lutz commenting upon the sloth parasites said the sloth has algæ on its hair in sufficient quantity to change the color of the hair and probably sufficient to supply the parasitic food.

Dr. Lutz exhibited a collection of Hippoboscids, degenerate Diptera, those feeding on sheep being destitute of wings. They are more abundant on birds, some on bats and few on mammals.

Dr. Osburn summarized the parasitic forms of Diptera, referring particularly to *Volucella* and *Microdon* as inquilines, *Eristalis* as occasionally found in human intestines, Muscidæ in wounds and nostrils, Œstridæ causing warbles, etc. He spoke of the Conopidæ as all parasitic, being rapid flyers, laying their eggs on flowers whereby they might be carried to the nest by bees; and commented upon the rapidity with which winged forms of Hippoboscidæ leave the host after its death. He also referred to Chigoes, Culicidæ and Black Flies and the great variety of adaptations to be noted in parasites on different hosts, adaptations often paralleled in different orders.

Mr. Davis donated photographs of the field meeting of February 22.

BACK VOLUMES AND NUMBERS.

Back volumes and numbers of the JOURNAL OF THE NEW YORK ENTOMOLOGICAL SOCIETY can be supplied at $2.00 per volume and $0.60 per number. Neumoegen and Dyar's Preliminary Revision of the Bombyces of America north of Mexico (150 pp.) sold separately at $1.50.

TITLES OF A FEW OF THE PAPERS IN THE JOURNAL.

COLEOPTERA.

	PAGES
Casey. Studies in the Ptinidæ, Cioidæ and Sphindidæ of America......	33
A revision of the American Coccinellidæ..........................	99
Review of the American Corylophidæ, Crytophagidæ, Tritomidæ and Dermestidæ, with other studies. (Cuts.)......................	121
Chittenden. The North American species of the genus Notaris........	3
Fall. On the affinities of the genus Tachycellus, with descriptions, etc....	10
Synopsis of the species of Acmæodera of America, north of Mexico..	35
A short synopsis of the species of Ochodæus inhabiting the U. S.....	9
A review of the North American species of Collops................	25
Leng. Notes on Coccinellidæ, I, II, III and IV. (In different numbers.) 9 pp., 1 pl.; 21 pp., 2 pl.; 12 pp., 1 pl.; 5 pp.	
Linell. A short review of the Chrysomelas of North America...........	5
Matheson. The Haliplidæ of North America, north of Mexico. (6 pl.)..	36
Schaeffer. New genera and species of Coleoptera.....................	39
New Scarabæidæ	15
New Clavicorn Coleoptera	6
New Coleoptera and miscellaneous notes	13
Sherman. A list of Labrador Coleoptera	25
Wheeler. Notes in Myrmecophilous beetles of the genus Xenodusa, etc..	6
Studies in Myrmecophiles. I. Cremastochilus. (Cuts.)............	11
Studies in Myrmecophiles. II. Hetærius. (Cut.)..................	8

LEPIDOPTERA.

Barnes and McDunnough. New species and varieties of N. A. Lepidoptera	14
New species and genera of N. A. Lepidoptera......................	11
Busck. A review of the Tortricid subfamily Phaloniinæ, etc............	18
New American Tineidæ. (1 pl.)..............................	14
Dyar. Review of the genus Ethmia, with descriptions of new species....	7
A review of the N. A. species of Prodoxus and Pronuba............	2
A review of the Hesperiidæ of the United States...................	32
Grinnell and Grinnell. The butterflies of the San Bernardino Mt., Cal...	13
The North American Nymphulinæ and Scopariinæ.................	31
Grossbeck. New moths of the family Geometridæ......................	13
Miscellaneous notes and descriptions of N. A. Geometridæ. (Cuts, 1 pl.)	10

JOURNAL

OF THE

New York Entomological Society.

VOL. XXI. SEPTEMBER, 1913. No. 3

TWO ADDITIONS TO THE LIST OF NEW JERSEY CONE-HEADED GRASSHOPPERS.

BY WILLIAM T. DAVIS,

NEW BRIGHTON, STATEN ISLAND, N. Y.

In the last edition of the Insects of New Jersey ten species of *Conocephaloides* are enumerated. The names *triops* (*dissimilis*), *retusus* and *atlanticus*, as there applied, probably refer to forms of one species, and *nebrascensis* was identified as such about the time *lyristes*, which it resembles, was described from Florida. This leaves seven species, with possibly one form of *triops* or *retusus* worthy of being separated as a variety under one of the above names. In *triops* the length of the ovipositor varies as much as 5 mm., but as this same thing occurs in undoubted specimens of *robustus*, the ovipositor must not be taken as an infallible guide.

In the Proceedings of the Academy of Natural Sciences of Philadelphia, June, 1907, p. 305, *Conocephalus melanorhinus* is described by Rehn and Hebard from a single female from Cedar Keys, Levy County, Florida. While at Tuckerton in the southern part of New Jersey, September 1, 1907, the writer collected a male *melanorhinus* on the edge of the meadows. So far these are the only two specimens known. The New Jersey example has been compared with the type and there is no doubt but what it is the same species. The fastigium

is of the same shape and is blackened beneath as in the Florida specimen. Measurements of the male are as follows:

Length of body	28	mm.
Length of fastigium beyond eyes	2.5	mm.
Length of pronotum	7	mm.
Greatest caudal width of disk of pronotum	4	mm.
Length of tegmen	33	mm.
Length of caudal femur	18	mm.

When males from the south are collected they will probably be found to average somewhat larger.

While at Erma, Cape May Co., N. J., in August, 1910, a few males of what appeared at the time to be *Conocephalus robustus* were collected in the meadow bordering Bradley's Run. When these were pinned in line and compared with undoubted *robustus* from Fire Island, N. Y., Staten Island, etc., it was seen that while they greatly resembled that species, the fastigium was more blunt in the specimens from Erma. In August, 1912, additional material was collected and the song listened to with care. While it consisted of the same continuous whirr as in *robustus,* it was not nearly so ear-splitting. There were no *robustus* to be heard about Erma or Cold Spring, but the following evening the colony at Chatsworth, N. J., was visited, so a near comparison in point of time was made. In the collection of the author there are two additional specimens like those from Erma; one collected at Virginia Beach, Va., July 20 (Geo. P. Engelhardt), and one from Herndon, Va., August, 1911 (H. G. Barber). The Erma, N. J., and Virginia insects resemble *Conocephalus crepitans* Scudder more nearly than any other described species, but seem to average a little less robust than examples of that insect from Kansas and Nebraska. The type of *crepitans* came from Texas. The Atlantic States or eastern *crepitans* appears to bear about the same relation to western *crepitans* as does *lyristes* to *nebrascensis* and *ensiger* to *attenuatus.* These comparisons may be more superficial than real, as I am unacquainted with the habits and songs of *nebrascensis* and *attenuatus.* There is no doubt, however, that we have in Virginia and New Jersey an insect that has been heretofore overlooked, and which for the time being may be considered as *crepitans.*

AN ARTIFICIAL TABLE OF THE SPECIES OF HADENA, ETC., OF EASTERN NORTH AMERICA, NORTH OF THE CAROLINAS.

By WM. T. M. FORBES,

WORCESTER, MASS.

The species included in this table are those usually put in *Hadena*, with the genera *Helotropha, Trachea,* etc., which are not readily separable from it. Some have been placed in *Eustrotia, Chytonix, Trachea, Dipterygia, Hadenella, Orthosia, Dryobota* and *Macronoctua*, as well as the genera *Luperina, Xylophasia, Parastichtis* (of Hamp., but not of Sm.), *Eumichtis, Oligia* (Hamp., but not Sm.), etc., which are usually considered subgenera of *Hadena;* but all are closely related to the *Hadenas* as commonly understood, or else commonly placed among them.

The group may be defined as normally trifid Noctuidæ,—with vein M_2 (5 of the German system) a little stronger in some specimens of *palliatricula*, etc., causing them to be sought among the Intermediids. The vestiture is usually mixed, never of simple hair and untufted, but often overlaid with rough hair, especially in the arctic species, and never of simple scales, but with the scales only a little lengthened in *hausta* and *exhausta*. The eyes are naked, and may be lightly, but never strongly, lashed. The thorax usually has a slight median crest in the more hairy forms, but the crest is never prominent and its distinctness depends on the position of the patagiæ and tegulæ. More often the thorax is roughly clothed with more or less divided crests, the appearance again depending largely on the position of the patagiæ and tegulæ, and the condition of the specimen. The antennæ are variable, pectinate in male *illocata*, rarely serrate, ciliate or fasciculate in the majority of forms, but simple and deeply prismatic in a few of the species related to *miselioides*. In the female they are always simple, so that this character is often useless for identification. The palpi are upturned but often with the third joint porrect, rarely reaching the vertex, the second joint mostly rough-scaled below. The tongue is developed, the eyes large except in *includens*, the front

smooth and somewhat rounded out, most so in *palliatricula, viridimusca,* etc., where it is also very narrow. The legs are unarmed, with hairy tibiæ, but without massive tufts on the tibiæ; the abdomen at least with a slight basal tuft, usually with several tufts, of which the third and fourth are normally largest. A single tuft is not conspicuously enlarged, and the basal one is not a fanlike mass of scales.

The group intergrades with the *Acronyctinæ* on the one hand and with *Eustrotia* on the other. From *Acronycta, Bryophila,* etc., in the last resort there seems to be no reliable separating character. In all the species I have examined of *Acronycta, Arsilonche, Microcœlia, Leuconycta, Bryophila* (*Bryocodia*) and *Polygrammate* the maxillary palpi are a little larger than in the *Hadenas* examined, projecting distinctly beyond the tip of the pilifer when the labial palpus is removed. However, the maxillary palpus is of the same character, terminated with a tuft of scales, in both, and the difference may be partly only apparent. If I am not mistaken this separation will associate *Leuconycta* (*diphteroides*) and *Bryophila* (*lepidula* and *teratophora*) with *Acronycta,* separating them from *Chytonix* and *Amyna orbica,* which have the small maxillary palpi. It will be interesting to see whether the caterpillars, when discovered, agree with this.

As to the related genera, *Crambodes, Oligia* (*Monodes*), *Balsa,* etc., are separated by the combination of nearly scaly vestiture and lack of tufting.

From *Eustrotia* (*Erastria*) the slenderest *Hadenas* differ only in the normal trifid venation, those species in which the venation is unstable, seeming to be always over an inch in expanse, and with vestiture at least of spatulate scales if not deeper.

In *Amolita, Senta,* etc., the tongue is weak.

Caradrina is slenderer and smaller than the *Luperinas,* being one to one and one half inches in expanse, and differs from the slender *Hadenas* in the untufted abdomen.

Perigea and *Amphipyra* have very glossy vestiture, palpi upturned to vertex and except in the *xanthioides* group closely scaled,—besides, in *Amphipyra* the abdomen is strongly flattened.

Polia combines a strong hair-tuft on basal joint of antennæ simulating lashes, or true lashes in front of the antennæ, with a nearly untufted abdomen.

In *Hyppa* the thorax is strongly flattened dorsally, without decided tufts, but with feathery vestiture.

In *Parastichtis* (*Tæniosca*) the palpi are upturned to the vertex, body slender, and eyes slightly lashed.

In *Euplexia* there is a single much enlarged tuft on the third segment of the abdomen, and the vestiture of the patagiæ is evenly cut off, not loose and hairy, at the edge.

Delta (*Actinotia* of American authors, but not of Europe) has massive tufts of hair on the tibiæ.

Prodenia and *Laphygma* have triangular translucent hind wings, with narrow dark veins and border. The thorax is not distinctly tufted in front, but has a strong spreading or divided tuft behind. In *Prodenia* there are several abdominal tufts, and in *Laphygma* but one.

Magusa has very large triangular hind wings and very narrow fore wings.

Homohadena has imbricate, apparently scaly vestiture as a rule, sometimes overlaid with hair; the eyes are distinctly lashed and the frontal vestiture is short and fine, unlike that of any other lashed-eyed forms.

Ommatostola and *Cosmia* (*Enargia*) have no tufts whatever and perfectly hairy vestiture, in *Calymnia* the vestiture is a little coarser.

In *Apamea, Ipimorpha* and *Atethmia* the apex is acute, subfalcate, and the outer margin perfectly even. The latter character distinguishes *Conservula* also.

Fagitana completely lacks M_2 of the hind wipg.

Agrotiphila and *Anchocelis* have small eyes.

In *Lithomia, Xylina* and *Litholomia* the frontal tuft above is very large, divided both longitudinally and transversely, and the eyes are strongly lashed.

Cucullia and in a less degree *Catabena* have much enlarged hood-like tegulæ, capable of being turned forward over the head.

Pyrrhia, Xanthia, etc., are distinguished by the very prominent anterior thoracic tuft or central ridge, *Amathes* by its heavily lashed eyes, and most of the other *Orthosiids* by the strongly flattened abdomen.

In *Brotolomia* the outer margin of the fore wing is strongly irregular, and in *Anomis* there is a small raised white orbicular tuft besides.

In *Trigonophora* the vestiture of the patagiæ is evenly sheared off, as in *Euplexia*.

Tapinostola has stumpy oblong wings combined with slight tufting. It seems to be confined to marshes.

The remaining *Noctuidæ* not considered here differ in strong and definite structural characters, mostly in the venation, armature of tibiæ, presence of hair on the eyes, or frontal modification. *Hillia* is not considered from lack of material but should be included, as it combines the structures of *Dryobota* with those of the *ducta* group.

1. All the veins contrasting, white .... *Luperina niveivenosa.*
1. Veins largely white on outer part of wing.... *Helotropha (Eustrotia) retis.*
1. With tip of stem of *Cu,* and base of Cu_1 and M_3 white, the other veins inconspicuous .... 2.
1. Without contrasting white veins .... 4.
2. Abdomen smooth .... *Luperina stipata.*
2. Abdomen tufted dorsally .... 3.
3. Expanse about two inches, body heavy and vestiture deep. *Helotropha reniformis.*
3. Expanse much less, body rather slender and vestiture almost scaly. *Helotropha (Eustrotia) caduca.*[1]
4. Marked more or less with green .... 5.
4. Without any decided green markings .... 7.
5. Contrasting white t.a. and t.p. lines...... *Chytonix (Hadena) viridimusca,* *Chytonix (Hadena) chlorostigma.*[2]
5. A large white reniform .... *Hadena miselioides.*
5. White marks inconspicuous .... 6.
6. Largely purple, an oblique pale shade along M_3 and Cu_1, with a triangular dark claviform below .... *Trachea delicata.*
6. Ground color green, evenly marked with blackish .... *Hadena miselioides.*
7. Dull black with velvety black markings.... *Xylophasia (Trachea) impulsa.*
7. Paler or with considerable pale markings .... 8.
8. Hind wing yellow with strong blackish veins, outer shade and post-medial line .... *Xylophasia (Trachea) inordinata.*
8. Hind wing not bright-colored .... 9.
9. Subterminal space finely striate on and between the veins. *Dipterygia (Hadena) patina.*

[1] *Caduca* is typically red-brown, blackish specimens of this appearance would perhaps be better placed in *H. retis.*

[2] These two names may represent but a single species. *H. chlorostigma* is described as smaller, expanding rather under 1 inch, with the green confined mostly to the centers of orbicular and reniform spots, and with a small black claviform. *H. viridimusca* is larger, with rather more green and larger dark-outlined claviform. Both belong to *Chytonix.*

9. Subterminal space at most with fine lines on the veins and black wedges or arrow-heads between ....10.
10. Median area above dash in submedian fold, contrasting, white. *Chytonix palliatricula.*
10. Median area not white and contrasting ....11.
11. A white spot in submedian fold before the t.p. line, connected by a black bar to t.a. line ....12.
11. No contrasting white dot before t.p. line in submedian space ....13.
12. Larger; t.p. line meeting inner margin at right angles...*Chytonix sensilis.*
12. Smaller; t.p. line oblique below ....*Chytonix palliatricula* var. *iaspis.*
13. Fore wing with almost even red-brown ground color, the margin darker. 14.
13. Ground color of medial area red, of subterminal area contrastingly paler gray ....15.
13. Ground color not decidedly red ....16.
14. Upper part of outer edge of fore wing transverse, reniform with white outline and central spot ....*Xylophasia (Agroperina) cogitata.*
14. Outer margin more oblique, reniform with outer white lunule only. *Xylophasia (Agroperina) lateritia.*
15. Medial area rose and orange, subterminal space pale blue-gray; small with straight costa ....*Hadena (Oligia) bridghami.*
15. Medial area deep red and black, st. space with a greenish cast, expanse two inches ....*Xylophasia (Parastichtis) arctica.*
15. Ground color crimson, small with strongly arched costa. *Hadenella (Oligia) minuscula.*
16. T.a. and t.p. lines closely approaching or joined near inner margin enclosing a brown triangular median area ...."*Helotropha*" *obtusa.*
16. T.a. and t.p. lines not enclosing a brown triangle ....17.
17. Eyes small, reniform formed of a semielliptical pale outer spot closely enclosed in a pale crescent ...."*Erastria*" *includens.*
17. Eyes moderate or large, reniform when contrastingly pale, composed of a white *central* lunule, finely dark-edged and enclosed in a pale spot..18.
18. Pale gray with a very strong black dash at tip of submedian fold; very small ....*Hadena (Oligia) exhausta.*
18. Without a decided dash in submedian fold at margin, or with brown ground color ....19.
19. Hind wing mostly pure white, contrasting ....*Luperina burgessi.*
19. Hind wing wholly shaded with fuscous, though often quite pale at base..20.
20. Brown, with a black dash at tip of submedian space and a smaller one before st. line between R_4 and R_5 .....*Hadena (Trachea) turbulenta.*
20. Otherwise marked, rarely with any distinct dash at hind angle ....21.
21. With a short blackish filled subreniform spot before t.p. line in submedian fold, connected to costa by a concave triangular dark patch; claviform also short and dark-filled ....*Hadena (Trachea) modica.*
21. Subreniform not distinct ....22.

22. Basal half of fore wing dark, outer half pale and contrasting; t.p. straight and black below cell forming the boundary; expanse 1¼". *Hadena (Oligia) diversicolor.*
22. With a quadrate dark patch on middle of inner margin, bounded by *Cu* and the nearly straight and parallel t.a. and t.p. lines; expanse under 1" .... *Hadena (Oligia) hausta.*
22. Wings rarely divided into a dark basal and light outer half, if so with normally sinuous t.p. line .... 23.
23. Blackish, evenly, with contrasting light brown margins, except before tip of costa .... *Luperina trigona.*
23. Not blackish and even with contrasting pale margins .... 24.
24. Subterminal with a long W-mark on veins M_3 and Cu_1, or with these veins black and accompanied by pale streaks to margin .... 25.
24. Subterminal line without a W-mark on M_3 and Cu_1, at most with teeth of about 60° .... 29.
25. With a heavy basal dash and a heavier patch in middle of submedian fold, without a distinct t.a. line or claviform between them .... 26.
25. Claviform and double t.a. line distinct between the two dashes when both are heavy .... 27.
26. Ground color mainly dark red-brown....*Xylophasia (Parastichtis) nigrior.*
26. Ground color more tawny in middle, clay-colored toward costa and grayish toward inner margin ....*Xylophasia (Parastichtis) verbascoides.*
27. Thoracic crest high and broadly divided; with a dark bar toward upper edge of patagiæ; ground color brownish .... 28.
27. Thoracic crest high and strongly divided; ground color even dull fuscous, the dashes at basal angle, basal dash and in middle of submedian fold all fine .... *Parastichtis dionea.*
27. Thoracic crest, not high, and often not distinctly divided; ground color bright tawny brown, without strong dark bands on thorax. *Xylophasia (Parastichtis) lignicolor.*
28. Scales beside veins paler than ground color, at least in subterminal space along M_3 and Cu_1 ....*Xylophasia (Parastichtis) cariosa.*
28. Ground color not paler along the veins..*Xylophasia (Parastichtis) vulgaris.*
29. Bright ochre with blackish markings ....*Orthosia (Agroperina) helva.*
29. Bright ochre with dull red markings, and sometimes with white reniform. *Perigea xanthioides.*
29. Not bright orange-ochre (*egens* is rather bright, but smoothly marked and without blackish) .... 30.
30. Collar and patagiæ black, and disc of thorax dark brown, usually contrasting with the paler wings ....*Xylophasia (Parastichtis) vultuosa.*
30. Thorax not contrastingly dark, or with the center darkest .... 31.
31. T.a. and t.p. lines connected by a heavy black bar in submedian fold.... 32.
31. T.a. and t.p. lines not connected, or with the bar lost in the blackish ground color .... 34.
32. Light reddish gray and red-brown, the median area below the dash con-

trastingly pale, outer margin containing more or less distinct blackish patches ....33.

32. Gray without red tint ....*Hadena mactata, lona* and *jocasta.*

32. Ash-gray shaded with red-brown, the bar very heavy and outer margin pale ....*Hadenella (Oligia) minuscula.*

32. Dark blackish brown ....*Xylophasia (Eumichtis) ducta.*

33. T.p. line much curved and oblique outward across submedian space, marked with pure white (as is the reniform) and subterminal space beyond, pale clay-color; male with pectinate antennæ. *Dryobota (Trachea) illocata.*

33. T.p. line oblique inwards, less curved in submedian space, the white all replaced by light clay-color, subterminal space shaded and dusted with light red; male antennæ simple. *Trachea indocilis (Xylophasia remissa).*

34. Black and white powdered ....*Hadena (Eremobia) claudens.*

34. Not clear black and white ....35.

35. Black basal dash the most contrasting mark..*Xylophasia (Trachea) finitima.*

35. Basal dash (above anal vein) inconspicuous if present ....36.

36. Dull yellow with paler subterminal space and no dark markings. *Hadena (Oligia) egens.*

36. Even dull yellow, powdered with red-brown, usually with dark reniform and powdery marginal shade ....*Agroperina (Orthosia) inficita.*

36. Dull yellow, reddish in medial area, with single dark t.a. and t.p. lines. *Xylophasia (Trichoplexia) exornata.*

36. Pale powdery luteous with red tint, dusted with brown toward margin. *Orthosia (Agroperina) lutosa.*

36. Light luteous-, or reddish brown, *shading to powdery gray* at inner margin, third joint of palpi long ....37.

36. Dull yellow, marked extensively with brown, with two blackish patches on margin ....38.

36. Wood brown, with contrasting blackish costa, extended in to fill cell and outer margin ....*Macronoctua onusta.*

36. Red-brown, mottled and marked with luteous, all diffusely. *Eremobia maillardi (Hadena exulis).*

36. Usually darker and not dull yellow or reddish.[1] 39

37. Middle of wing decidedly paler and yellower, contrasting with the reddish costa ....*Xylophasia (Parastichtis) rorulenta.*

37. Wing almost evenly colored ....*Xylophasia (Parastichtis) suffusca.*

38. A contrasting blackish patch on costa, extending between orb. and ren. *Xylophasia (Parastichtis) vultuosa.*

38. No such contrasting patch ....*Xylophasia (Parastichtis) apamiformis.*

39. Abdomen without decided tufts, vestiture very fine, thoracic tufts slight. *Luperina passer* and *birnata.*

39. Abdomen with a strong basal and sometimes a second weaker tuft. *Xylophasia (Sidemia) devastatrix.*

[1] *Passer* is occasionally dull reddish, but nearly evenly, without a suggestion of the powdery mottling of *maillardi.*

39. Abdomen with a series of tufts .... 40.
40. Expanse about 1¼ in.; black, rather crisply marked, usually with pale reniform .... *Hadena (Oligia) misera.*
40. Deep brown with white reniform or outer lunule in reniform, expanse an inch and a half or more .... 41.
40. Not normally deep chocolate brown or black, and if so without white in reniform, usually dull fuscous, expanse over an inch and a half ... 43.
40. Expanse usually about 1⅛ in.; mostly dull fuscous, often with reddish tinge, with paler inner edge and subterminal space or black spots on margin .... *Hadena (Oligia) fractilinea.*
41. White lunule in outer part of reniform only.
Xylophasia (Parastichtis) plutonia.
41. Reniform largely white .... 42.
42. T.a. and t.p. lines distinct though not contrasting, paler and nearly even.
Xylophasia (Agroperina) dubitans.
42. T.a. and t.p. lines wholly obscure; ground color always somewhat reddish.
Xylophasia (Agroperina) cogitata.
43. Mottled, subterminal without any suggestion of a W-mark on M_3 and Cu_1, veins often with paler streaks; eyes not lashed.
Eremobia maillardi var. (*Hadena exulis*).
43. Veins not tending to be marked with paler streaks; with a distinct W-mark on the subterminal line, which however reaches only half way to margin; subterminal white and preceded by black wedges; eyes lashed.
Xylophasia (Eumichtis) ducta.

THE GENUS PHILOBIA DUPONCHEL, AND SOME REPRESENTATIVES IN OUR FAUNA. (LEP., GEOM.)

BY RICHARD F. PEARSALL,

BROOKLYN, N. Y.

The genus *Philobia* was established by Duponchel in 1829, having *notota* Linn., a European species, as its type. Curtis, in 1826, published his genus *Macaria,* of which *liturata* (Clerck.), also a European species, is type. The most obvious difference between these types is presented in the structure of the hind legs of the male. In *notata* the tibia is but slightly swollen, with a small external pencil of hairs, and the long tarsi equal about two thirds its length, while in *liturata* the

tibia is long, greatly swollen and contains within its sheath a heavy brush of hairs, while the tarsi are so short as to equal little more than one third its length. Both these genera appear to me to be well founded, but European authorities, I believe, group both *notata* and *liturata* under the genus *Macaria*. I have considered it proper, in view of the facts presented, to recognize *Philobia* as the genus under which our species should be marshalled. The names *notata* Linn. and *enotata* Guen. have been applied indefinitely to our species. Dr. Packard (Mons. Geom. Moths, 1876) placed both under *Semiothisa,* a composite Hubnerian genus, and later Dr. Hulst (Classif. Geom. of N. A., 1896) endeavored to correct this by using the genus *Philobia,* but he was clearly unable to distinguish one species from the other, as he confesses. We must discard both these names, for neither of them has a place in our fauna. The former certainly has not; the latter, the type of which came from Brazil, may, by chance, enter our southern boundary, but has not as yet been taken, so far as I can ascertain. For others of this group he erected the genus *Sciagraphia,* but its type, *granitata* Guen., is a *Macaria* in my opinion, and if so, *Sciagraphia* must fall as a synonym. We are left, then, with a small group of *Philobia* species, all, with one exception, being without names. So far as my material permits, I have separated them, using the genitalia largely to confirm my species. In general appearance and markings they resemble one another closely and yet when massed in series as I have them, it is rather obvious that they are distinct forms. Authors heretofore have stated that the male in *Philobia* is without hair pencil on the hind tibiæ, and in flown examples this appears to be so, only because it has been removed by abrasion, probably when copulation takes place. I have already noted a like occurrence in the genus *Epimecis* Hub. (Can. Ent., Vol. 38, p. 179), my specimens in that instance having been reared from larvæ, yet in all flown males of it that I have since examined, and they are many, no trace is left of this appendage except the cicatrix, or scar, where it was attached. In the case of *notata* my attention was first directed to it, when I received, through the kindness of Mr. Prout, a male from Budapest. This fine specimen had short hair pencils attached to the inside of the tibiæ, just below the joint, and, in order that he might see "with his own eyes," I returned the example to him. However, it is before me now, as I write, with a single hind leg and hair pencil intact, after

crossing the Atlantic three times. Upon examining all my males in this group, I found but two with traces of the pencil present, the rest showing only the scar where it had been attached. My male type of *perplexata* n. sp. hereinafter described, has the hair pencil on both legs seemingly intact, in length about half that of the tibia, the hair very fine and curled at the tips. In *notata* it is straight and coarser.

PHILOBIA Dup.

1829. Histoire Nat., VII, 195. Type, *notata* Linn.

In this genus the antennæ are serrate, each joint, toothed near the outer end, is tipped with a fascicle of hairs in the ♂, almost simple and evenly ciliate with a fine hair-like bristle in the ♀. Front rounded, smooth, palpi slightly extended beyond it; tongue well-developed; hind tibiæ with two pair of spurs in both sexes, the male with a small external pencil of hairs, generally removed by abrasion. Thorax and abdomen without tufts. Wings rather broad, the costa of primaries much rounded at apex, and below it the outer margin excavated between veins R^5 and M^3, and in the ♂ a fovea below, at base beneath cell. Secondaries with sharp angular point at margin, opposite vein M^3.

Philobia ulsterata new species.

Expanse, ♂ 24–28 mm., ♀ 25–30 mm. Front, palpi, antennæ and collar brownish ochre, the latter decidedly darker. Body and all wings above are white, but peppered thinly, and minutely strigate with dusky scales; they have a soiled appearance. Dusky lines cross primaries, their inception at costa marked with heavy dark chocolate brown spots. The basal spot linear, crossing costa toward outer margin and continued by a narrow dusky line, curving outward to inner margin. The second spot is quadrate, and the line from it is usually broader and darker and runs straight across wing, often waved in its course. The extra discal is linear, and like the basal in its direction across costa to vein M', then in a fine line of same color, wavy and heavily marked at center of wing, fading into dusky below, runs direct to inner margins. Apical spot broad, quadrate, extending to vein M', leaving between it and the extra discal spot a triangular white space at costa. Broken below vein M', the line reappears, at wing center, as three heavy dark spots, separated by the white veinings, the central one much the largest. All cross lines marked with two or three dark brown scales at vein crossings. A heavy dark brown marginal within excavation below apex, and dots between the veins

below it, along outer margin. Fringes white, heavier and purplish brown within excavation. Secondaries are crossed by two lines, the basal apparently a continuation of the intradiscal of primaries; straight or a little wavy, the extra discal slightly curved outward is also a continuation of the primary outer line, and on both wings is accompanied by a broken dusky shade line or band in submarginal space. The round discal dots dark brown, distinct; none on primaries; marginal dots as on primaries, fringes white. Beneath, the veins and costa are ochraceous, and the white surface more heavily sprinkled with dark scales basally and along costal region of primaries. Lines reproduced as above, the intradiscal, heavy and dark brown, crosses both wings. The extra discal, fine and clear at costa, fades out toward inner margin of primaries, and outside, parallel to it, there is on both wings a broad, irregular band, varying in my series of thirty-six specimens from dull purplish brown, through ochre brown to rusty ochre. Discal spots dark brown, large, distinct, linear on primaries, round on secondaries. The apico-costal spot on the primaries is well marked, but ochre brown in color, and the three round dusky spots at center and outside extra discal line are present, but less clear in outline than above. The marginal line within excavation broken, and the fringe paler, nearly white, otherwise as above. Body the color of wings, thinly sprinkled with dark scales, the abdomen ochreous at tip, with a double row of six to seven dark brown dorsal dots, and a single row on each side below lateral margin in both sexes. Legs tinged with ochreous, blotched with dark brown.

Types.—One ♂ from Big Indian Valley, Catskill Mts., N. Y., VI, 28, 1907, and one ♀ from Big Indian Valley, Cats. Mts., N. Y., July 8, 1898, are in the author's collection, with co-types of seven males and eight females from the same locality, dates ranging from May 28 to July 10, and one male from Long Island, N. Y., June 21, 1889, all taken by the writer.

Habitat.—This, our largest species, is single brooded, and is not uncommonly found from Penna. north and eastward, more plentifully in the mountain districts.

Philobia æmulataria Walker.

1861. Walker, List Lep. Brit. Mus., XXIII, 884. *Macaria.*

1872. Zeller, Verh. zool.-bot. Ges. Wien, XX, 487. *Macaria.*

1874. Morrison, Proc. Bost. Soc. Nat. Hist., XVI, 198. *Macaria sectomaculata.*

1876. Packard, Monog. Geom., 288, Pl. X, Fig. 15. *Semiothisa enotata* Guen.

The type of *æmulataria*, a ♂ from "New York" is in the British Museum. A specimen, now present in my collection, has been com-

pared with the type, through the courtesy of Mr. L. B. Prout, and bears his label, reading, "æmulataria Walk. ♂ (his supposed ♀ from E. Florida differs) compared with type. L. B. P." Walker's name is therefore limited to the ♂ from "New York" and is referable here.

Habitat.—Common throughout the middle and eastern states. Though I take it on the Catskill Mts., it is not so common there as is *ulsterata,* seeming to prefer the lower levels. It ranges smaller in size than that species, and in color is a decided ochraceous, not white, and the sectional central spots are larger, more conspicuous than in any other species. Morrison's type of *sectomaculata* in the U. S. Nat. Museum Coll. is a large ♀ labeled "Hyde Park, Ms., May 25." A ♀ *æmulataria* in my collection, compared with it, is an exact counterpart, and at the time of my visit (April, 1912) Dr. Dyar also concurred in this opinion.

Philobia perplexata new species.

Expanse, ♂ 24 mm., ♀ 26 mm. Palpi, front, antennæ and collar deep ochre or buff. Costal edge marked with a few dark brown strigæ, chiefly toward base, and scales of the same color are sparingly sprinkled over the antennæ above, and mark the cross lines at veins. Body and wings above are covered with soiled, white and ochreous scales, intermixed about equally, giving an ochreous tinge, and the veins are ochreous above and beneath. Cross lines as in *ulsterata* well defined, ochre yellow; the basal of primaries has less outward curve; the intradiscal, after crossing costa touches the upper point of a lineate discal spot of the same color, thence inside it straight to inner margin. The apico-costal spot, a little rusty at its inception, is continued across both wings as a broad buff band, outside and close to extra discal line, and includes the divided dark brown spots at center of primaries, at which point also the extra discal becomes broader and dark brown. Marginal dark brown line broken into spots or dashes between veins. Fringe heavy in excavation, below apex, chocolate with a purplish tinge, elsewhere pale ochreous. The round discal dots on secondaries are distinct, dark brown. Beneath, the costa is broadly ochreous; the ochre ground tint is generally deeper and the brown specks larger and darker. Lines reproduced as above, distinct, brown, the broad outer band more broken, deeper ochre, and in highly colored examples like the male type, is traversed centrally by a row of purple brown spots that are enlarged and intensified in color at center of all wings. In paler specimens they become mere blurs. Fringes as above. Discal spots black, linear on primaries, a round distinct dot on secondaries. Legs ochreous, with brown scales and strigæ. Abdomen with a double row of dorsal black spots on first to seventh segments in females, often confined to the first and second in males.

Types.—One male and one female from Provo, Utah (Spalding), captured, the former July 26, 1909, the latter June 7, 1910.

Habitat.—Before me I have fifty-four examples of this species, all taken at Provo in 1909 and 1910, and at Eureka, Utah, in 1911, from which I have selected eight males and eight females as co-types. The dates, ranging from June 24 to July 30, would indicate the species to be single brooded.

Philobia versitata new species.

Expanse, ♂ 22 mm., ♀ 24 mm. Palpi, front, antennæ and collar pale brownish ochreous, the cross lines and broad outer band also of this color, intensified and in some examples tinged with rust red at costa. Ground color of body and wings much as in *perplexata*, but paler, the veins ochreous. Extreme costal edge of primaries with strigæ and scattered spots of dark brown. The heavy dark brown central spot is present, but its outline is square, and the parts tend to coalesce. The vein crossings but slightly marked. Marginal lines on primaries heavy, dark brown within excavation, broken into spots below it, almost continuous on secondaries. Fringes within excavation dark brown, with a pale line at base, elsewhere on all wings pale ochre. Discal spots linear on primaries, pale ochreous, sometimes brownish; round on secondaries, dark brown. Beneath much as above, but the lines and band are pale yellow brown. The central brown spot but feebly portrayed, often not at all. Marginal line and fringe as above. Discal marks linear on primaries, round on secondaries, distinct, dark brown. In the ♀ the abdomen above sometimes has double spots of pale ochreous in first and second segments, that of the males unspotted. Legs tinged with ochre and sparingly spotted with brownish scales.

Types.—One ♂, Clear Creek, Col. (Oslar), May 27, 1908, and one ♀, Rico, Col. (Oslar), July 7, 1905.

Co-types, two males and two females, Chimney Gulch, Golden, Col., June 21, 1908, one ♂ and one ♀, Clear Creek, Col., May 27, 1908, and one ♀, Rico, Col., July 7, 1905. My material is rather scant in this species, but the genitalia show a decided difference from any other form. It is our smallest species in both sexes. Males of *æmulataria* and *aspirata* are nearly of the same size, but the females of the former are much larger.

Habitat.—Central Colorado.

Philobia aspirata new species.

Expanse, ♂ 22 mm., ♀ 26 mm. Palpi, front, antennæ and collar dull grayish ochre, the palpi pale, almost white at tip as is a narrow line on front just

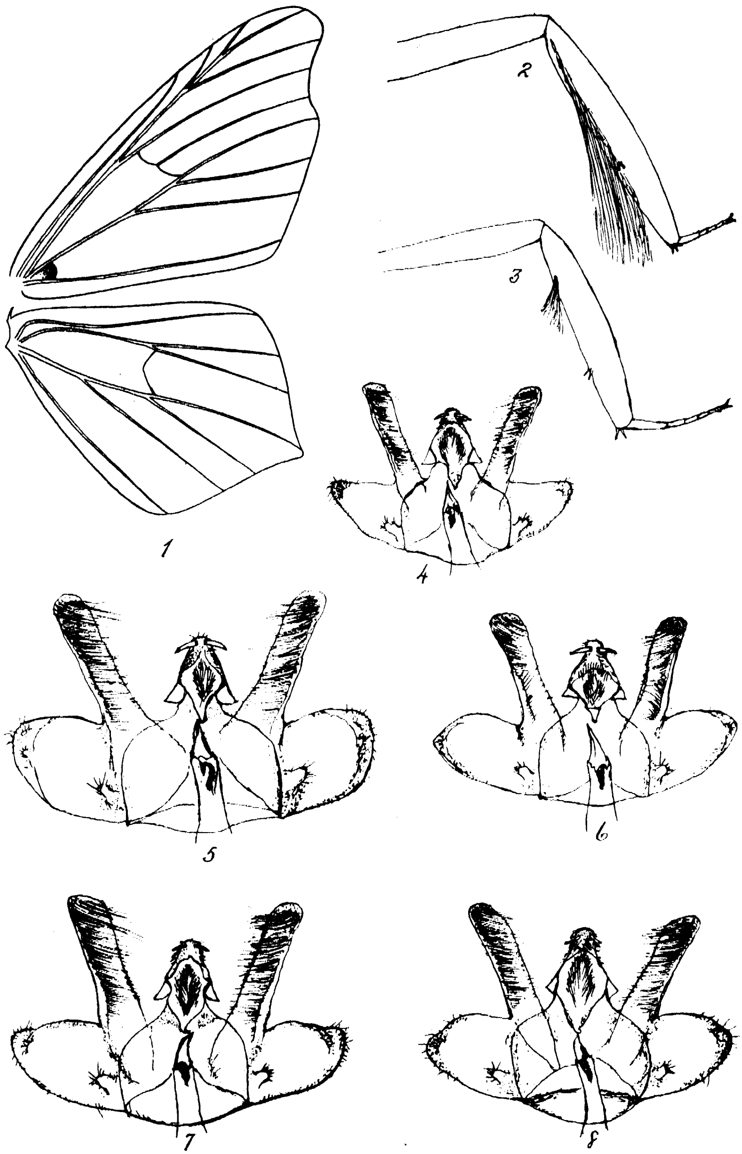
above clypeus. Ground color of body and wings cream white, heavily flecked with grayish ochre scales, the subterminal space often so thickly covered as to quite obscure the ground color. Veins more faintly outlined with ochre than in other species. Cross lines as in others of the group, but grayish, and the broad outer band if present is poorly defined or quite obliterated by the heavy gray scaling. Costa at base and at inception of cross lines marked with dark brown spots and dashes, the large spot at wing center is of the same color, rather clearly defined and the cross lines at veins are dotted. Marginal line within excavation heavy, dark brown, the fringe paler brown, with a purplish tinge, lighter at base. Elsewhere the marginal line is indistinct or much broken and the fringe ochreous gray. Discal marks on primaries very faint, linear, on secondaries a small round dark brown dot. Beneath, the cross lines are reproduced as above, rather heavy but the flecks of grayish scales are dense only near base of wings and subcostally leaving the ground color of other parts much clearer than above. The subterminal broad band is rusty ochre and much broken, including at wing centers of both primaries and secondaries diffuse brownish spots between veins at M^3. Marginal line and fringes as above. Discal marks more clearly defined. Body beneath and legs sprinkled with brown scales and the abdomen marked dorsally with a double row of six or seven spots in the female, on the first and second segments only in the male.

Types.—One ♂ and one ♀ from Prescott, Arizona (Dr. Kunze), August 16, 1909, and August 22, 1909, respectively.

Habitat.—My material is limited to Arizona, but I am quite certain I have seen specimens from Texas that are the same.

Co-types are two males, Palmerlee, Cochise Co., Ariz., in August, 1905, one female, Douglas, Ariz., August 23, 1908, and one female, Prescott, Ariz., August 14, 1909.

In preparing mounts of the genitalia here depicted, I found it quite impossible to avoid a measure of distortion to some of the parts, when pressure of the glass cover was applied. I therefore prepared a second series, and with their aid corrected my drawings, so that they are as nearly counterparts as I could make them, being careful not to exaggerate the points of specific difference when noted. To the Rev. C. R. N. Burrows, of Essex, Eng., I am indebted for drawings of the genitalia of *notata, alternata* and *liturata,* all of England, as well as some appendages of the imagoes that were essential for comparison.



Philobia

EXPLANATION OF PLATE III.

1. Venation of ♂ *Philobia ulsterata.*
2. Hind leg of ♂ *Macaria.*
3. Hind leg of ♂ *Philobia.*
4. Genitalia of ♂ *Philobia æmulataria.*
5. Genitalia of ♂ *Philobia ulsterata.*
6. Genitalia of ♂ *Philobia versitata.*
7. Genitalia of ♂ *Philobia perplexata.*
8. Genitalia of ♂ *Philobia aspirata.*

REPORT ON A COLLECTION OF CRANEFLIES (TIPULIDÆ, DIPT.) FROM THE COLOMBIAN ANDES, TAKEN BY MR. JOHN THOMAS LLOYD.

BY CHARLES P. ALEXANDER,

ITHACA, N. Y.[1]

A rather extensive collection of craneflies taken by Mr. John Thomas Lloyd on the central chain of the Andes in southwestern Colombia, March, 1912, was handed to me for study. The types have been deposited in the Cornell University collection, where the remainder of the Andean insects are preserved; certain of the paratypes are in the author's cabinet. Mr. Lloyd and Dr. A. A. Allen, whose bird collections have been considered in a recent paper by Frank M. Chapman,[2] undertook this trip along the Cordillera Central in the spring of 1912. The itinerary of the expedition as originally planned was much more extensive, but serious illness in the party prevented collecting after leaving the "Valle de las Papas."

The collection embraces some 125 specimens referable to 22 species, of which 15 are herein described as new. The only published paper which considers craneflies from this altitude of the Andes is by von Röder, "Dipteren von der Cordilleren in Columbien."[3]

The following data regarding the localities collected in was furnished by Mr. Lloyd and Dr. Allen.

[1] Contribution from the Entomological Laboratory, Cornell University.

[2] Bull. Am. Mus. Nat. Hist., Vol. 31, Art. 16, pp. 139, 140.

[3] Victor von Röder, Stett. Ent. Zeit., Vol. 47, pp. 257–270 (1886).

Valle de las Papas, "the valley of potatoes," on the Cordillera Central of the Andes near the summit at an altitude of about 10,000 feet. The Rio Caqueta, one of the principal tributaries of the Upper Amazon, flows through the valley. The valley spreads out as a flat expanse several miles in width, the surface sparsely overgrown with a tall grass suggesting prairie grass, in the wet places replaced by rushes closely allied to *Scirpus;* bog mosses, *Sphagnum* sp., occurs abundantly almost everywhere except in the wooded places. At various spots, especially in the neighborhood of the river, clumps of scattered trees occur, with numerous bushes in between; these trees resemble mesquite and have comparatively little moss. It was from amongst these tree clumps that most of the craneflies labelled "Valle de las Papas" were taken. It is possible that some came from the "cloud" or "moss" forest on the slopes above the valley, as in a few places the edge of the "cloud" forest came close up to the tree clumps, though in most instances it was at least one eighth of a mile away.

The floral, avifaunal and climatic conditions of the valley are almost exactly the same as those occurring above tree line in the true paramo; however, it is at a much lower altitude (10,000–10,300 feet) than the true paramo (12,600 feet and over) and is separated from the latter by a cloud forest belt of varying width. Ecologically the flora of the paramo is a psychrophytic or cold soil formation;[1] it is described as being a subglacial fell field "supporting a typical, open vegetation, the individuals of which are scattered in small tufts, and display growth-form exactly corresponding to those in northern fell-fields; cushion-like growth is perhaps more common. . . . Despite great humidity, frequent rain and mist, which the sun may suddenly dissipate, the vegetation is xerophytic, as Göbel's descriptions demonstrate; many plants occur with pinoid, cupressoid, juncoid or woolly-haired leaves." Besides a large number of Holarctic genera of plants, there are many genera peculiar to the region; the most notable single plant of the paramo is probably the "great frailejon," *Espeletia grandiflora* Humb. et Bonpl., a remarkable Composite plant growing 6 to 8 feet in height; a good figure of *Espeletia* is shown in Engler und Prantl[2] and in Plate 1 of this article.

The "cloud" forest or "moss" forest which surrounds the valley

[1] Eug. Warming, Œcology of Plants, Sec. 9, pp. 258–259, 1909.

[2] Die Natürlichen Pflanzenfamilien, Vol. 4, Pt. 4, p. 217, Fig. 109.

is always overhung by clouds; it is a region of very heavy and almost constant precipitation; during the time when the collection was made it rained almost continuously every day. Trees are abundant and thickly draped with a dense covering of moss, with an abundance of ferns and vines and many orchids, the whole composing a dense tangle through which passage must be cut with a knife. (See Plate IV, lower figure.)

Almaguer, 20 miles west of the "Valle de las Papas"; the village of that name is at an altitude of about 7,500 feet, but the craneflies so labelled were taken in the vicinity of a camp on the mountain ridge west of the village, at an altitude of 10,500 feet. This is in the "moss" forest and most of the insects were obtained along a trail cut through the forest; in the open places *Sphagnum* grows commonly and blue-berries with non-edible woody fruit occur in abundance along the trail wherever trees have been removed.

Popayan, 40 miles N.N.E. of Almaguer, at an altitude of 6,500 feet; this is below the level of the "cloud" forest and is largely open country with savannah conditions, open hills with little woods except along the rivers.

The collection by species is as follows:

Subfamily LIMNOBINÆ.

Tribe LIMNOBINI.

Genus **DICRANOMYIA** Stephens.

1. **Dicranomyia elegantula new species.**

Allied to *gloriosa* Alex.; wings dark brown on anterior half, with large white spots, posterior half almost clear.

Male, wing, 7.5 mm.

Female, length, 6.8 mm.; wing, 8.4 mm.

Rostrum and palpi dark brown; antennæ dark brownish black, the segments of the flagellum rounded; front, vertex and occiput yellowish brown, the median line a little darker, the region adjoining the eye a little brighter, yellowish.

Mesonotal præscutum medially dark brown, a broad triangular patch of yellowish gray bloom on the sides of the sclerite just behind the pseudosuture, the point of the triangle directed inward, on the sides of the sclerite in front of the pseudosuture the color in certain lights is very dark, velvety black, in

other lights almost white; scutum dark brown with a paler bloom along the front margin; scutellum dark brown with a diamond-shaped patch of gray bloom in the middle; postnotum brown. Pleuræ black, the mesopleuræ largely covered with a silvery white bloom, a narrow brown stripe cuts across this patch from the cervical sclerites to the scutellum. Halteres whitish, with the knob brown. Legs with the coxæ and trochanters brown, femora light yellow, rest of the legs gone. Wings with the anterior half brown with rounded white spots, a series of about eight in the radial cell, a large spot at the end of *Sc*, extending caudad to the radial sector, other spots in cell *2nd* R_1 and R_3. The caudal cells of the wings are almost hyaline with scattered brown markings, a brown suffusion along *Cu* and its fork, in cell *1st A* and on the anal angle of the wing. Venation: *Sc* long, Sc_2 at its tip; *Rs* long, much longer than the very long deflection of R_{4+5}; inner ends of cells R_3 and Cu_1 almost in a line. (See Pl. 2, fig. 2.)

Abdomen brown.

Holotype, ♀, Almaguer, March 11, 1912.

Allotype, ♂, with the type.

The allotype has the femora much darker, brown, narrowly tipped with yellowish.

D. elegantula approaches *gloriosa* Alex.[1] (Guatemala) in its long *Sc* and general coloration; the venation, especially as regards the long deflection of R_{4+5}, is very different; the pale color of the anal cells is a conspicuous character.

In regard to the patches of pollen occurring on the thorax of this group of species, it should perhaps be stated that this varies considerably in different lights and the student must take this factor into account.

2. **Dicranomyia cordillerensis new species.**

Subcosta long, thorax brownish yellow, wings pale brownish with scanty brown spots.

Female, length, somewhat shrunken, 7.6 mm.; wing, 11.2 mm.

Rostrum and palpi dark brownish black; antennæ dark brownish black, the flagellar segments oval, gradually more elongated toward the tip; head gray.

Mesonotal præscutum shiny brownish yellow, becoming more brownish behind; scutum, scutellum and postnotum dark brown. Pleuræ dull brownish yellow. Halteres long, pale, knob darker. Legs, coxæ and trochanters dull light yellow, remainder of the legs broken. Wings, pale brownish, cells *C* and *Sc* rich yellow; a conspicuous brown spot at the origin of *Rs*, a smaller one at the tip of *Sc*, a very large stigmal blotch, indistinct seams on the crossveins

[1] C. P. Alexander, Canadian Entomologist, November, 1912, pp. 337, 338; Pl. 11, fig. *j*.

and deflections of veins which make up the cord and the outer end of cell *1st* M_2. Venation: *Sc* long, extending far beyond the origin of *Rs, Rs* angular and spurred at origin, almost straight beyond the angulation, deflection of R_{4+5} short. (See Pl. 2, fig. 1.)

Abdominal tergites brown, sternites yellowish, the sclerites suffused with brown behind and on the sides.

Holotype, ♀, Valle de las Papas, March 29, 1912.

Agrees most closely with *D. ornatipennis* Blanchard (Chile), but the wing pattern, as described for the latter, is different, the crossveins not margined with darker. *D. lincicollis* Blanchard is a much smaller species, with a dark lateral, thoracic stripe.

3. **Dicranomyia andicola Alexander.**

1912. *Furcomyia andicola* Alexander, Can. Ent., December, 1912, p. 362; Pl. 11, fig. *h*.

Three males and one female from Almaguer, March 11, 1912.

The ventral lobes of the male hypopygium are conspicuous, yellow, produced into a short, rounded protuberance near the base on the inside and here with two long slightly curved, pointed spines; lower or cephalic side of this protuberance with a comb of long bristles. Ventral projections of the pleura very elongate, cylindrical, the base narrowed. Dorsal apical appendage of the pleura very stout, short, strongly curved. Caudal margin of the 9th tergite concave.

4. **Dicranomyia insignifica Alexander.**

1912. *Furcomyia insignifica* Alexander, Can. Ent., December, 1912, p. 363; Pl. 11, fig. *i*.

About 40 specimens, both sexes, from Almaguer, March 11, 1912, and Valle de las Papas, March 22 to 29, 1912.

The 9th tergite of the male hypopygium has a deep median notch on the caudal margin; pleuræ very short, the inner face beset with stout spines, near the middle produced into a chitinized arm which is provided with spines at short intervals and is tipped with long hairs; pleura with two apical appendages, the dorsal one very short, about as long as the pleura and strongly curved; the ventral appendage very large, fleshy, very much larger than the pleura, its inner margin near the base with a small protuberance bearing two stout spines, on the ventral margin cephalad of these spines are three large bristles; pleura with a large rounded lobe on the ventral side. (See Plate 3, fig. 1.)

5. **Dicranomyia longiventris new species.**

Male, length, 7.3 mm.; wing, 8 mm.; abdomen, 6.8 mm.

Rostrum yellowish, palpi pale brown; antennæ dark brownish black, flagellar segments oval, more elongated toward the tip of the organ; head gray.

Mesonotal præscutum light yellowish brown, a broad brown median stripe with a narrower lateral stripe on either side behind joined to the caudal end of the median stripe; scutum with the lobes dark brown, median line whitish; scutellum and postnotum yellowish brown. Pleuræ pale, dull whitish. Halteres very long, brown, the knob a little darker. Legs long, brownish. Wings subhyaline, stigma feebly indicated; venation (see Pl. 2, fig. 3): Sc_1 very long, Rs short, about as long as the deflection of R_{4+5}, but much more arcuated.

Abdomen very long and slender, tergites dark brown, the lateral and caudal margins of the sclerites narrowly pale, yellowish; sternites pale, dull yellowish. Hypopygium with the 9th tergite oval, the latero-caudal angles broadly rounded, the caudal margin slightly concave. Pleuræ short and stout, the dorsal apical appendage long, slender, simple, ending in a sharp curved point; the ventral appendage is a fleshy lobe much longer than the pleura; from the base of this lobe is borne another chitinized appendage which is enlarged at its base, deeply bifid at its tip, one of the two teeth obtuse and ending in long hairs, the other shorter and pointed; midlength of this arm are two pointed spines; this appendage is apparently borne by the base of the fleshy ventral lobes. From the ventral side of the pleura projects a conspicuous fleshy lobe bearing long hairs; guard of the penis uniform in width, a little pointed at the tip. (See Pl. 3, fig. 2.)

Holotype, ♂, Valle de las Papas, March 29, 1912.

Allotype, ♀, with the type.

Paratypes, 6 ♂, 2 ♀, Valle de las Papas, March 22 to 29, 1912.

D. longiventris belongs to the *halterata* group (*halterata* O. S., *particeps* Doane, *simillima* Alex., et al.) with very long Sc_1 and exceedingly long halteres. The extremely long abdomen easily separates it from these allied forms.

Genus **GERANOMYIA** Haliday.

6. **Geranomyia sp.**

One specimen from Almaguer, March 11, 1912, in too poor condition to determine. It belongs to the group of species containing *rostrata* Say, *insignis* Loew, etc.

Tribe ANTOCHINI.

Genus **ATARBA** Osten Sacken.

7. Atarba columbiana new species.

General color yellow, wings broad with the stigma indistinct, femora with a brown subapical ring.

Male, length about 6 mm.; wing, 7.8 mm.

Female, length, 5.5 mm.; wing, 7.4–7.8 mm.

Rostrum brownish yellow, palpi very dark brown; antennæ elongated, the segments of the flagellum elongate-oval, antennæ light yellowish brown, with a dense white pubescence; head light yellowish gray.

Mesonotal præscutum rather shiny, dull yellow, without apparent stripes, sometimes with a brown suffusion; remainder of the mesonotum similar. Pleuræ light yellow. Halteres short, stem pale, knob darker. Legs bright yellow, femora with a conspicuous brown ring just before the tip, tarsi with segments 2 to 5 and the tip of segment 1 brown. Wings subhyaline, iridescent, stigma indistinct, veins in the costal region yellow, others brown. Venation (see Pl. 2, fig. 4): *Sc* short, Sc_1 ending opposite the origin of *Rs*; Sc_1 about five times as long as Sc_2; cell *1st* M_2 about square; basal deflection of Cu_1 beyond the fork of *M*.

Abdominal tergites dark brown, the hypopygium a little brighter colored, sternites yellowish brown.

Holotype, ♂, Almaguer, March 11, 1912.

Allotype, ♀, with the type.

Paratypes, 1 ♂, 1 ♀, with the type.

A. columbiana differs from all of the known species of the genus in its brown femoral rings. As I have indicated in previous papers, the species of *Atarba* described by de Meijere, Williston and others are not members of this genus but aberrant species of the Eriopterine genus *Gonomyia*.

Tribe ERIOPTERINI.

Genus **GONOMYIA** Meigen.

8. Gonomyia andicola new species.

Basal flagellar segments swollen, thoracic dorsum dark clove brown, pleuræ with a broad yellowish band, wings tinged with darker.

Male, length, 5 mm.; wing, 6.6 mm.

Female, length, 5.5 mm.; wing, 7.3 mm.

Rostrum and palpi dark brownish black; antennæ dark brownish black, scapal and four basal segments of the flagellum enlarged, oval, the remaining flagellar segments abruptly becoming elongate-oval; head dark brownish gray.

Mesothoracic dorsum dark clove brown without distinct darker stripes, lateral margin of the sclerite narrowly bright yellow, extending from one wing-base to the other, broadest in front; scutum dark brown; scutellum dull yellow, postnotum brown. Pleuræ dark brownish gray, with a broad oblique band, yellowish in some lights, whitish in others, extending from above and behind the posterior coxæ towards the cervical sclerites, ending on the mesopleuræ. Halteres pale, knob brown. Legs, coxæ light brown, darker basally, remainder of the leg dark brown. Wings suffused with darker, veins dark brown. Venation (see Pl. 2, fig. 6): *Sc* long, ending rather far beyond the origin of *Rs*, fork of R_{2+3} long, about as long as its petiole, veins issuing from cell *1st* M_2 long, basal deflection of Cu_1 before the middle of cell *1st* M_2.

Abdomen dark grayish brown. Male hypopygium (see Pl. 3, fig. 3) with the 9th tergite produced into a prominent median lobe which is deeply notched. Pleural pieces elongate-cylindrical, the dorsal inner angle produced entad into a short subchitinized arm; from the end of the pleura is a strong, curved, chitinized hook, directed entad and cephalad, a few short hairs at intervals along this hook; behind the chitinized hook is a straight fleshy appendage directed caudad; gonapophyses long, straight, directed caudad, at the tip somewhat twisted and strongly chitinized, before the tip on the inner face, with a strong curved spine; guard of the penis long and slender, scarcely enlarged at the tip, which is truncated.

Holotype, ♂, Valle de las Papas, March 29, 1912.
Allotype, ♀, with the type.
Paratypes, 13 males, 4 females, with the type.

Genus ERIOPTERA Meigen.

Subgenus MESOCYPHONA Osten Sacken.

9. **Erioptera (Mesocyphona) sp.**

Two specimens, ♂, ♀, from the Valle de las Papas, March 29, 1912, not in proper condition to determine more accurately.

Subgenus ERIOPTERA Meigen.

10. **Erioptera (Erioptera) andina new species.**

Brown, the pronotal scutellum light yellow, legs brown, wings suffused with brown, halteres brown at the tip, the stem pale.

Male, length, about 4 mm.; wing, 6 mm.

Female, length, 4.7 mm.; wing, 6.3 mm.

Rostrum, palpi and antennæ dark brown; front, vertex and occiput dark brownish.

Pronotal scutellum light yellow, showing off conspicuously against the dark brown of the rest of the thorax. Mesonotal præscutum dark brown, lateral edges of the sclerite paler, occupying the region before the pseudosutural fovea; remainder of the mesonotum dark brown. Pleuræ dark plumbeous brown. Halteres large, stem pale yellowish, knob brown. Legs, coxæ and trochanters dull yellow, remainder of the legs brown. Wings with a faint brown suffusion, stigmal region elongate, brown, veins brown. Venation (see Pl. 2, fig. 5).

Abdomen dark brown. Male hypopygium (see Pl. 3, fig. 6). The 9th tergite is a quadrate plate with its caudal margin broadly emarginate, the edge with small teeth. Pleural pieces rather long, cylindrical, the inner ventral angle produced into a lobe, the tip of the pleurites bearing long hairs; two apical appendages, both chitinized, the ventral one slender basally, more enlarged and irregularly spatulate at the tip; the dorsal appendage long, slender and acutely pointed at the tip. The apophyses consist of a median quadrate plate with its caudal margin straight or nearly so, produced into indistinct points at the lateral angles; on either side of this plate is a slender chitinized rod directed caudad.

Holotype, ♂, Valle de las Papas, March 29, 1912.

Allotype, ♀, with the type.

Paratype, ♂, with the type.

This is the first neotropical species of the subgenus to be described.

Genus **MOLOPHILUS** Curtis.

11. **Molophilus perseus new species.**

Male antennæ short, thorax light yellowish brown, wings nearly hyaline, veins light yellow, male hypopygium with the lower pleural lobe provided with a strong chitinized appendage which is serrated on the caudal margin.

Male, length, 4.8 mm.; wing, 6.2 mm.

Female, length, 5–5.3 mm.; wing, 6.8–7.6 mm.

Rostrum and palpi dark brown; antennæ with the basal segment yellow, the remainder of the antennæ dark brown, the flagellar segments elongated; head dark brown.

Thoracic dorsum light yellowish brown without distinct stripes, extreme margin of the præscutum pale yellowish white; scutum and scutellum brown, postnotum dark brown. Pleuræ dark brown. Halteres light yellow. Legs light yellow, hind and middle tarsi darker. Wings subhyaline, veins light yellow, especially bright along the costa and at the base of the wing.

Abdomen dark brown. Male hypopygium (see Pl. 3, figs. 4 and 5) with the pleural pieces very short and broad, divided by a membranous notch into two lobes; viewed from above with an oval lobe projecting caudad, this lobe concave on its dorsal inner face and here provided with a strong chitinized

U-shaped hook, the inner edge of the lobe produced into a less chitinized hook. Viewed from beneath, the pleura has a lower lobe separated from the dorsal one by membrane; this lower lobe is provided with a powerful chitinized appendage ending in a long straight point, the caudal or outer edge with prominent, regular teeth, the inner or cephalic margin of this appendage with a few long bristles near the base.

Holotype, ♂, Valle de las Papas, March 29, 1912.
Allotype, ♀, with the type.
Paratypes, 1 ♂, 2 ♀, with the type.

Genus **TRIMICRA** Osten Sacken.

12. **Trimicra sp.**

One female from the Valle de las Papas, March 29, 1912; it is in too poor condition to determine beyond the genus.

Tribe LIMNOPHILINI.

Genus **EPIPHRAGMA** Osten Sacken.

13. **Epiphragma cordillerensis new species.**

Thorax with five dark lines, one being median, femora with a conspicuous subapical brown ring with indications of a second, postmedian ring, wings light brown with darker ocellate markings.

Male, length, 7.2–8 mm.; wing, 9–9.4 mm.

Female, length, 10–10.8 mm.; wing, 10.3–12.8 mm.

Rostrum and palpi dark brown; antennæ with the scapal segments dark brownish black, the rather enlarged first segment of the flagellum bright orange-yellow, remaining segments of the flagellum dark brownish black; front, vertex and occiput dark brown, a pale buff margin along the eyes and two buff spots on the occiput.

Præscutum with a broad brown median stripe, which continues to the suture; sides of the sclerite a little darker, region between these brown markings with a golden yellow bloom; scutum light yellow, the center of each lobe and the median depression brown; scutellum grayish brown with a median brown stripe; postnotum gray with a brown median stripe and a rounded brown spot on either side near the end of the basal half. Pleuræ grayish, a dark brown stripe extending from the head across the cervical and pronotal sclerite to the metathorax. Halteres rather long, pale, the knobs a little darker. Legs with the coxæ yellowish, the extreme base traversed by a dark brown band, trochanters brownish yellow, femora yellowish, darkening to brown before the tip, a subapical or apical ring of yellow, tibiæ brownish yellow, tarsi brown. Wings with a dull yellow suffusion and with abundant brown ocellate

markings, the largest at the origin of *Rs*, with numerous other marks in all the cells; a series of five subequal oval spots in cell *2nd A*. Venation as in Pl. 2, fig. 8.

Abdominal tergites brown, sternites dull yellow, the extreme lateral margin brown.

In some specimens the only mark on the yellow femora is the broad subapical brown band.

Holotype, ♂, Popayan, March 1, 1912 (by sweeping).

Allotype, ♀, Valle de las Papas, March 22, 1912.

Paratypes, 3 ♂, 1 ♀, with the allotype.

In my key to the American species of *Epiphragma*[1] this would run down to *solatrix* Osten Sacken of the eastern United States, from which it differs in the much more ocellate character of the wing pattern and other characters.

Genus **OROMYIA** new genus.

(non *Oreomyza* Pokorny, Wien. Ent. Zeit., Vol. 6, 1887).

Antennæ of the male elongated, the scapal segments greatly swollen, globular, the elongate first segment of the flagellum arising abruptly from the last scapal segment, flagellar segments much elongated, the whole antennæ about as long as the body; there are only 12 antennal segments in my unique specimen, but the total number is very probably 16. Tibiæ with two long, slender spurs. Wings with subcosta short, ending opposite the origin of the radial sector; the sector is short, arcuated; R_2 short, oblique, crossvein *r* lacking. Male genitalia with the 9th sternite produced caudad into a conspicuous lyriform plate.

Type of the genus, *Oromyia lloydi* new species.

In my key to the Limnophiline genera[2] *Oromyia* would run down to *Phyllolabis* Osten Sacken[3] of the western Nearctic fauna, which is presumably its nearest ally, both genera agreeing in the lack of crossvein *r* and cell M_1. They may be separated by the following key:

1. Subcosta very long, ending opposite the fork of *Rs*; R_2 not oblique and as long as R_{2+3}; crossvein *m* prominent as long as *r–m*; basal deflection of Cu_1 very far distad, so that *Cu* and *M* do not fuse. Male genitalia with the 8th sternite bearing a pale foliaceous appendage, broad at the base,

[1] C. P. Alexander, Proc. U. S. Nat. Mus., Vol. 44, No. 1966, p. 535.

[2] Alexander, Proc. U. S. Nat. Mus., Vol. 44, No. 1966, p. 525.

[3] Osten Sacken, Western Diptera, Bull. U. S. Geol. Survey, Vol. 3, pp. 202, 203 (1877).

narrower on the apical half and very deeply split medially. Male antennæ of the normal Limnophiline type, the flagellar segments not elongated, the antennæ reaching about to the wing-base.

Phyllolabis Osten Sacken.

Subcosta short, ending opposite the origin of *Rs*; R_2 very short, oblique, simulating a crossvein; crossvein *m* short, tending to be obliterated by the long second deflection of M_3; basal deflection of Cu_1 under the middle of the square cell *1st* M_2. Male genitalia with the 9th sternite produced caudad into a conspicuous lyriform plate. Male antennæ elongated, as long as the body ....*Oromyia* new genus.

14. **Oromyia lloydi new species.**

Thorax dull yellow; wings subhyaline with a large stigma.

Male, length, 5.5 mm.; wing, 6.8 mm.; antennæ, about 6 mm.

Hind leg, femur, 5.6 mm.; tibia, 5.2 mm.; tarsus, 4.2 mm.

Rostrum and palpi dark brown; antennæ with the scape and the extreme base of the first flagellar segment reddish yellow, remainder of the antennæ dark brownish black; front and clypeus brown, with a gray bloom; front, vertex and occiput gray.

Thoracic dorsum dull yellow without distinct stripes; pleuræ more brownish yellow. Halteres yellow, knob broken. Legs, coxæ and trochanters light yellow, femora light yellow at base, darkening rather abruptly into brown; tibiæ and tarsi brown. Wings subhyaline, stigma rather square, brown; veins dark brown. Venation as in the genus. (See Pl. 2, fig. 7.)

Abdomen with the two basal tergites dark brown, 3d to 5th yellowish basally, brown apically; remaining segments brown. Sternites with the second segment brown with a rounded yellowish median spot; segments 3 to 6 brown, the basal portion yellowish, this covering about one half on segment 3 and about one fourth on segment 6; remaining sternites dark brownish black. Hypopygium with the 8th sternite produced caudad into a long cylindrical protuberance which is thickly covered with long hairs; 9th sternite broad at the base, at the tip produced into a chitinized lyriform appendage, this appendage directed caudad, at the apex of each arm bearing a dorsally directed slender hair-like point. Pleural pieces broad at the base, narrowed and truncated at apex, clothed with long dense hairs; two chitinized apical appendages, the dorsal one cylindrical, somewhat enlarged at the tip; ventral appendage stouter, produced into a long hook at the apex, on the lower face with numerous appressed teeth. (See Pl. 3, figs. 7–9.)

Holotype, ♂, Valle de las Papas, March 29, 1912.

The type of this new genus is named in honor of the collector, Mr. J. T. Lloyd.

Genus LIMNOPHILA Macquart.

15. **Limnophila lloydi new species.**

Color of the head and thorax light gray, wings hyaline, with four costal blotches of brown, the largest near the tip of the wing, other cells of the wing with scattered brown dots.

Male, length, 8.2 mm.; wing, 9.6 mm.

Rostrum and palpi dark brown; antennæ with the scapal segments dark brown with a gray bloom, flagellar segments brown; front, vertex and occiput with a broad light gray median stripe, the region adjoining the eye rich yellowish brown.

Pronotum light gray; mesonotal præscutum light gray, with a linear rich rust brown streak on either side of the median line near the pseudosuture, two brown spots on either side near the transverse suture; scutum, scutellum and postnotum light gray, the latter broadly margined with dark brown behind. Pleuræ, propleuræ brown with a yellow bloom, mesopleuræ dark brown, the metapleuræ even darker. Halteres light yellow throughout. Legs, fore coxæ yellowish with a slightly darker bloom, trochanters yellow above, brown beneath, femora yellowish becoming browner before the tip, tibiæ yellow, brown at the tip, tarsi yellowish, each segment tipped with brown; middle and hind legs similar but the coxæ and trochanters are brown. Wings long and narrow, rather pointed at the tip, hyaline with yellow veins; conspicuous brown marks as follows: one at the base of cell *R*, a second at the origin of *Rs*, a third, larger, including the tip of *Sc*, the fork of R_{2+3} and down the cord to cell *1st* M_2; a fourth, very large blotch, occupying the ends of cells *2d* R_1, R_2 and R_3; a few scattered dots at the ends of the veins and in most of the cells. Venation, see Pl. 2, fig. 9.

Abdominal tergites yellowish brown, brightest medially, the apical sclerites rather darker; sternites yellowish brown.

Holotype, ♂, Valle de las Papas, March 29, 1912.

This species is dedicated to the collector, Mr. J. T. Lloyd.

This species suggests *Lecteria conspersa* Enderlein[1] (Brazil) in its wing pattern but in all other respects is quite different. It also bears a resemblance to *Limnophila guttulatissima* Alexander (Guatemala),[2] in which the thorax is pale brown spotted with darker brown and the wings with a greater abundance of brown dots.

16. **Limnophila orophila new species.**

Blackish, wings dull yellowish, crossveins *r* and *m* lacking.

Male, length, 5–5.2 mm.; wing, 5.3–5.7 mm.

Rostrum and palpi dark brownish black; antennæ black, the 2d segment

[1] Gunther Enderlein, Zoöl. Jahrb., Vol. 32, Pt. 1, pp. 49, 50 (1912).

[2] C. P. Alexander, Proc. U. S. Nat. Mus., Vol. 44, No. 1966, p. 546.

large, rounded, flagellar segments rounded oval, gradually decreasing in size to the tip; front, vertex and occiput dull black with a sparse grayish bloom.

Thorax black with a sparse brownish bloom on the sides of the præscutum adjoining the pseudosuture, scutum, scutellum and postnotum black with a brownish bloom. Pleuræ black with a brown bloom. Halteres, stem light brown, knob darker. Legs, coxæ and trochanters dull brownish yellow, remainder of the legs dark brownish black. Wings with a dull yellow suffusion, no stigmal spot, veins yellow. Venation, crossveins *r* and *m* obliterated, cell M_1 gone by the fusion of M_1 and M_2, basal deflection of Cu_1 beyond the fork of *M*.

Abdomen black, the hypopygium a little browner. Male genitalia with the pleural lobes rather stout, with two apical appendages, the more dorsal, fleshy basally and here with long hairs, chitinized on the apical half, the tip deeply bifid; the ventral appendage is subchitinized, cylindrical, simple, the tip rounded.

Holotype, ♂, Almaguer, March 11, 1912.
Paratypes, 2 ♂, with the type.

Subfamily TIPULINÆ.

Tribe TIPULINI.

Genus **PACHYRHINA** Macquart.

17. **Pachyrhina alleni new species.**

Head black, reddish around the base of the antennæ; thorax with the predominating color black with narrow yellow lines and spots; abdomen with the basal half yellowish red, the tip black; wings with a pale brown suffusion.

Male, length, 10.6–11.2 mm.; wing, 11–12 mm.; antennæ, about 3.5–4 mm.

Rostrum and palpi dark brownish black; antennæ short, blackish, the flagellar segments very short, cylindrical, scarcely concave on the inner face, terminal antennal segments shorter and more slender; frontal tubercle and region around the base of the antennæ dull orange-yellow, frontal prolongation of the head, vertex and occiput dark brownish black, genæ provided with abundant long black hairs.

Pronotum dark brownish black, the scutum broadly bright yellow above. Mesonotal præscutum orange-yellow, with three very broad black stripes which almost conceal the ground color, the median one very broad in front, narrowed to a point behind at the suture, the lateral stripes begin behind the conspicuous straight pseudosuture and run caudad, interrupted by a dull yellow patch on the lateral angles behind; the yellow ground color of the præscutum is broadest in front before the pseudosuture, almost obliterated behind; scutum dull yellow, each lobe with a conspicuous black blotch, these being caudal extensions of the

lateral præscutal stripes; scutellum dull brown, darker, blackish, anteriorly brighter, yellowish on the sides, this color continued cephalad onto the lateral margins of the scutum; postnotum dark brownish black with a dull yellow blotch on the cephalic margin, one on either side of the median line. Pleuræ brownish black, paler dorsally, an elongate yellow blotch on the extreme lateral edge of the præscutum, appearing pleural in position, just above the anterior spiracle; tegula conspicuous, bright yellow; a conspicuous yellow stripe on the side of the postnotum, also appearing to be pleural in position, this stripe being cephalad of the base of the halteres and cephalo-dorsad of the mesospiracle. Halteres light brown. Legs, coxæ and trochanters light brown, the former darker basally, femora light brownish yellow, the fore femora darker, brownish, tibiæ brown, tarsi broken. Wings with a uniform pale brownish tinge, cells *C* and *Sc* a little brighter, stigma brown, veins dark brown. Venation (see Pl. 4, fig. 5); Cu_1 fuses with *M* for a distance about equal to the crossvein *r-m* and breaks away before the fork of *M*.

Abdominal tergites 1 and 2 reddish brown, 3 reddish yellow with a brown blotch near the base, 4 reddish yellow, 5 to 9 dark brownish black; sternites 1 to 4, reddish yellow, 5 to 6 similar, the caudal margins of the sclerites broadly blackish, segments 7 and 8 dark brownish black, the latter at the tip densely clothed with bright orange hairs. Hypopygium with the 9th tergite having an oval notch, the caudal margin with abundant chitinized points and denticulæ. Pleural suture long, prominent; pleura bearing two lobes, the outer lobe fleshy, very broad and flat, provided with dense hairs, its tip pointed; the inner lobe is large, chitinized, especially on the cephalic margin, where it is produced into a large appressed tooth. (See Pl. 4, fig. 8.)

Holotype, ♂, Valle de las Papas, March 29, 1912.

Paratype, ♂, with the type.

This species is named in honor of Dr. A. A. Allen of Cornell University.

P. alleni is allied to *usta* Osten Sacken of Costa Rica (Biol. Cent. Amer. Dipt., Vol. 1, pp. 17, 18) in the predominance of the black color on the thorax. It differs in many respects, having much more dark color on the head, abdomen with the basal half reddish yellow, not black, etc.

18. **Pachyrhina nigrolutea Bellardi.**

1859. *Tipula nigrolutea* Bellardi, Ditterologia Messicana, Vol. I, p. 11.

One female from Popayan, March 1, 1912, by sweeping.

Genus **TIPULA** Linnæus.

19. **Tipula carizona new species.**

Monilifera group; wings light brown, subhyaline markings scanty; abdomen yellowish brown, trivittate with darker brown.

Male, length, 11.4–13.2 mm.; wing, 13.3–14.5 mm.; antennæ, 9 mm.

Palpi dark brown; antennæ of the *monilifera* type of structure, scapal segments light yellowish brown, third segment with the basal half yellowish brown, passing into dark brown at the tip, remainder of the antennæ dark brown; frontal prolongation of the head brown with a gray bloom; front, vertex and occiput light gray with three longitudinal brownish stripes, one median and one along either inner margin of the eye.

Pronotum light gray, with a very narrow and indistinct median brown mark, sides of the sclerites darker. Mesonotal præscutum light gray, with darker longitudinal stripes as follows: a very narrow brown median stripe extending the length of the sclerite, on either side of this, narrowly separated by a strip of the ground color, is a gray band, behind the pseudosutural or humeral region begin the abbreviated grayish lateral stripes, sides of the sclerite brown, much of the gray ground color is speckled with dark brown; scutum gray, with the lobes brown, a dark brown median spot on the caudal margin of the sclerite, this running back across the scutellum as a median vitta; scutellum very pale gray, with the caudal margin broadly dark brown; postnotum clear gray, with a conspicuous dark brown median stripe and a spot of the same color on the sides of the basal half of the sclerite. Pleuræ light gray, with large indistinct markings of brown. Halteres light brown, the knob a little darker. Legs, coxæ light brown, with a gray bloom, trochanters and femora light brown, the latter broadly dark brown apically, tibiæ brown, the dark tip still broader, tarsi dark brown. Wings with a rather uniform light brown suffusion, stigma a little darker brown, a subhyaline spot beyond the stigma in cell *2d* R_1, a second along the cord, most noticeable in cells *1st* M_2 and base of M_3. Venation as in Pl. 4, fig. 7.

Abdominal tergites yellowish brown, with a dark brown median stripe extending to the 8th segment, lateral margins of the sclerites dark brown; sternites yellowish, becoming much more infuscated along the apical segments. Male hypopygium: 9th tergite from above with the caudal margin deeply and broadly incised, this broad notch with a median protuberance which is again incised by a triangular cut, ventral margin of the 9th tergite produced entad into a rounded lobe. 8th sternite produced caudad into a long flat point, which is densely clothed with long hairs, viewed from beneath this appendage is seen to be constricted at the extreme base, soon widening. 9th sternite rather large, the pleural piece complete, oval, bearing three appendages, the more dorsal being long, slender, fleshy and directed dorsad, clothed with long pale hairs; the more ventral appendage projecting caudad from the ventro-caudal angle of the sclerite, short, densely clothed with short appressed hairs; the median appendage is largest and longest, its base about as wide as the length of the pleura, the appendage narrowed before the enlarged axe-like tip,

which is chitinized on its apical margin. Central vesicle small with a prominent apophyse directed dorsad and cephalad; the penis is short and proportionately thick, its walls with numerous transverse lines, the base of the penis scarcely anterior to the central vesicle. Other prominent appendages of the genital chamber are a pair of chitinized flattened pieces on either side of the penis, on the dorsal margin produced dorsad into spoonlike points. (See Pl. 4, figs. 2–4.)

Holotype, ♂, Valle de las Papas, March 29, 1912.

Allotype, ♀, with the type.

Paratypes, 10 ♂, March 22 to 29, 1912, with the type. One ♂ frrom Almaguer, March 11, 1912.

Variations: in some specimens, the shaft of each of the flagellar segments is much paler, yellowish brown, than the swollen base. In many individuals the thorax lacks the gray bloom which produces this body color but this is probably due to the condition of the specimens. The wings of some with an indistinct subhyaline band beginning before the stigma and running obliquely toward the base of the wing.

The specific name is that of a native Indian tribe; spelled also "carijona." They inhabit the banks of the upper Yapura River.

T. carizona is related to *moniliformis* Röder[1] but I cannot identify this as Röder's species. *Moniliformis* is described as having yellowish and hyaline conspicuously diversified wings, whereas in *carizona* the wings are pale brown with the whitish or subhyaline markings very reduced. The thorax in *moniliformis* is brown without distinct stripes, in *carizona* gray, vittate with darker; no mention is made in the description of *moniliformis* of the conspicuous trivittate condition of the abdominal tergum. In *monilifera* Loew the wing pattern is also conspicuously diversified brown and white; here the caudal prolongation of the 8th sternite is much shorter, the penis much longer and more slender, the shapes of the 9th tergite and the median pleural appendage quite different and the 9th sternite produced into a conspicuous median lobe.

20. Tipula monilifera Loew.

1851. *Tipula monilifera* Loew, Linnæa Entomol., Vol. 5, p. 404; Pl. 2, figs. 26–27.

One male from Popayan, March 1, 1912, and another male from the Valle de las Papas, March 29, 1912.

[1] Victor von Röder, Stett. Ent. Zeit., 1886, pp. 259, 260.

21. **Tipula mocoa new species.**

Size medium (wing, ♀, 20 mm.); color light brown, thorax with five darker brown lines, the median one narrowest, femora brown, with a conspicuous yellow subapical ring, wings hyaline variegated with numerous gray and brown blotches.

Female, length, about 18 mm.; wing, 20.8 mm.

Palpi and frontal prolongation of the head dark brown; antennæ with the scapal segments yellowish, first flagellar segment with the basal two thirds light brown, remainder yellow, next five segments with the basal third black, rest yellow, apical flagellar segments dark brownish black; vertex and occiput dark grayish brown, the region adjoining the eye paler, yellowish.

Pronotum dark brown, darkest medially. Mesonotal præscutum light brown, with darker brown stripes, the median one very narrow and runs the length of the sclerite; on either side of it is a broader brown stripe which bends slightly distad near the middle of the sclerite and then becomes confluent with the median stripe near the suture, in front spreading out and occupying the region in front of the pseudosuture, lateral stripes rather short surrounded by the pale ground color of the præscutum, sides of the sclerite behind rather bright yellowish; scutum gray, the lobes with two dark brown spots of which the anterior one is the smaller; scutellum and postnotum dull yellow with a narrow brown median line. Pleuræ grayish with two large blotches on the mesepipleuræ. Halteres brown, the knob a little yellowish. Legs, coxæ brownish yellow, gray pollinose, trochanters dull yellow, femora dull yellow basally, soon darkening to the tip with a broad yellow subapical ring, tibiæ and tarsi brown. Wings hyaline, cell *C* pale yellowish brown, wings with numerous gray and brown clouds on the disc as follows: a large one at the stigma, at the fork of *Cu*, in the anal cells, in the middle of cell *M*, at the origin of *Rs* and in the middle of cell *R*; a gray blotch in the radial cell and clouds at the ends of the longitudinal veins. Venation as in Pl. 4, fig. 6.

Abdominal tergites rich brown with indications of a darker dorsal stripe, pleural region a little browner, especially on the basal segments, sternites yellowish brown. Ovipositor with the tergal valves very long and slender, the tips rather obtuse, sternal valves rather long, slender, extending about one half the length of the upper valves.

Holotype, ♀, Valle de las Papas, March 29, 1912.

The specific name is that of a native Indian tribe, dwelling on the banks of the upper Caqueta.

22. **Tipula miranha new species.**

Size large (wing, ♀, 25 mm. or over); color yellowish, thorax with three brown stripes, the median one bisected, abdomen brown or yellowish brown, with three darker brown lines on the tergum and a median one on the sternum, wings infumed with brownish yellow.

Female, length, 20–22 mm.; wing, 25–26.5 mm.

Palpi brown, frontal prolongation of the head rich orange yellow, brownish beneath; antennæ with the scapal segments very small, dull yellow, flagellum broken; front, vertex and occiput orange yellow with a narrow, indistinct brown median line, sides of the vertex and the genæ a little suffused with brown.

Pronotum dull yellow, a little brown on the sides and on the median line. Mesonotal præscutum dull brownish yellow with three dark brown lines, of which the median one is double, being bisected by a pale line, the median stripe is broadest in front, where it spreads out over the sclerite, narrowed behind, the lateral stripes are much shorter, elongate oval; scutum dull brownish yellow, each lobe with two large brown spots; scutellum dull yellow, pale brown on the sides; postnotum dull yellow with a moderately broad pale brown median line and a rounded pale brown spot on either side in front. Pleuræ dull brownish yellow, becoming more brownish on the mesosternum. Halteres brown, paler at the extreme base. Legs, coxæ yellowish brown, trochanters similar, femora light brownish yellow, the tip narrowly brown, tibiæ brown, the tips scarcely darker, tarsi brown. Wings with a pale brown suffusion, costal and subcostal cells more yellowish, stigma brown, veins yellowish brown. Venation as in Pl. 4, fig. 7.

Abdominal tergites yellowish brown, with a moderately broad median brown stripe which spreads out on the 6th and 7th segments, a broad, irregular lateral band near the margin of the tergites; sternites dull yellow, with a broad brownish median stripe. Ovipositor with the tergal valves very long and slender, flattened and rather gradually narrowed to the rather acute tips; sternal valves very short, extending only beyond the base of the tergal valves, the tips, viewed from the side, obtusely rounded.

Holotype, ♀, Valle de las Papas, March 29, 1912.

Paratype, ♀, with the type.

The specific name is that of a native Indian tribe, dwelling on the middle Putumayo River.

T. miranha is allied to *T. paulseni* Philippi (Chile) in its unmarked wings, color of the antennæ, etc.; the thorax and abdomen are not gray or grayish, however.

EXPLANATION OF PLATES.

PLATE IV.

Upper figure, view in the Valle de las Papas, Colombia, showing the 'paramo' conditions.

Lower figure, view in the 'cloud' forest, near the Valle de las Papas.

Photos by John Thomas Lloyd.

PLATE V.

Fig. 1. Wing of *Dicranomyia cordillerensis* n. sp.
Fig. 2. Wing of *D. elegantula* n. sp.
Fig. 3. Wing of *D. longiventris* n. sp.
Fig. 4. Wing of *Atarba columbiana* n. sp.
Fig. 5. Wing of *Erioptera andina* n. sp.
Fig. 6. Wing of *Gonomyia andicola* n. sp.
Fig. 7. Wing of *Oromyia lloydi* n. sp.
Fig. 8. Wing of *Epiphragma cordillerensis* n. sp.
Fig. 9. Wing of *Limnophila lloydi* n. sp.

PLATE VI.

Fig. 1. Hypopygium of *Dicranomyia insignifica* Alexander. Ventral aspect

Fig. 2. Hypopygium of *Dicranomyia longiventris* n. sp. Ventral aspect. $\imath$ = ventral pleural lobe; p = guard of the penis; t = 9th tergite from beneath

Fig. 3. Hypopygium of *Gonomyia andicola* n. sp. Dorsal aspect. t = 9tl tergite from above; pl = pleura.

Fig. 4. Hypopygium of *Molophilus perseus* n. sp. Ventral aspect, showing the ventral edge of the pleura.

Fig. 5. Hypopygium of *Molophilus perseus* n. sp. Ventral aspect, showing the dorsal edge of the pleura.

Fig. 6. Hypopygium of *Erioptera andina* n. sp. Dorsal aspect. t = 9th tergite from above.

Fig. 7. Hypopygium of *Oromyia lloydi* n. sp. Ventral aspect. $8s$ = 8th sternite; $9s$ = 9th sternite.

Fig. 8. Hypopygium of *Oromyia lloydi* n. sp. Lateral aspect. $9s$ = 9th sternite; pl = pleura.

Fig. 9. Hypopygium of *Oromyia lloydi* n. sp. Pleura and appendages.

PLATE VII.

Fig. 1. Wing of *Tipula miranha* n. sp.

Fig. 2. Hypopygium of *Tipula carizona* n. sp. Lateral aspect. $8s$ = 8th sternite; $9s$ = 9th sternite; pl = pleura; $9t$ = 9th tergite.

Fig. 3. Hypopygium of *Tipula carizona* n. sp. The penis and its vesicles.

Fig. 4. Hypopygium of *Tipula carizona* n. sp. The pleura and its appendages from a ventro-lateral aspect.

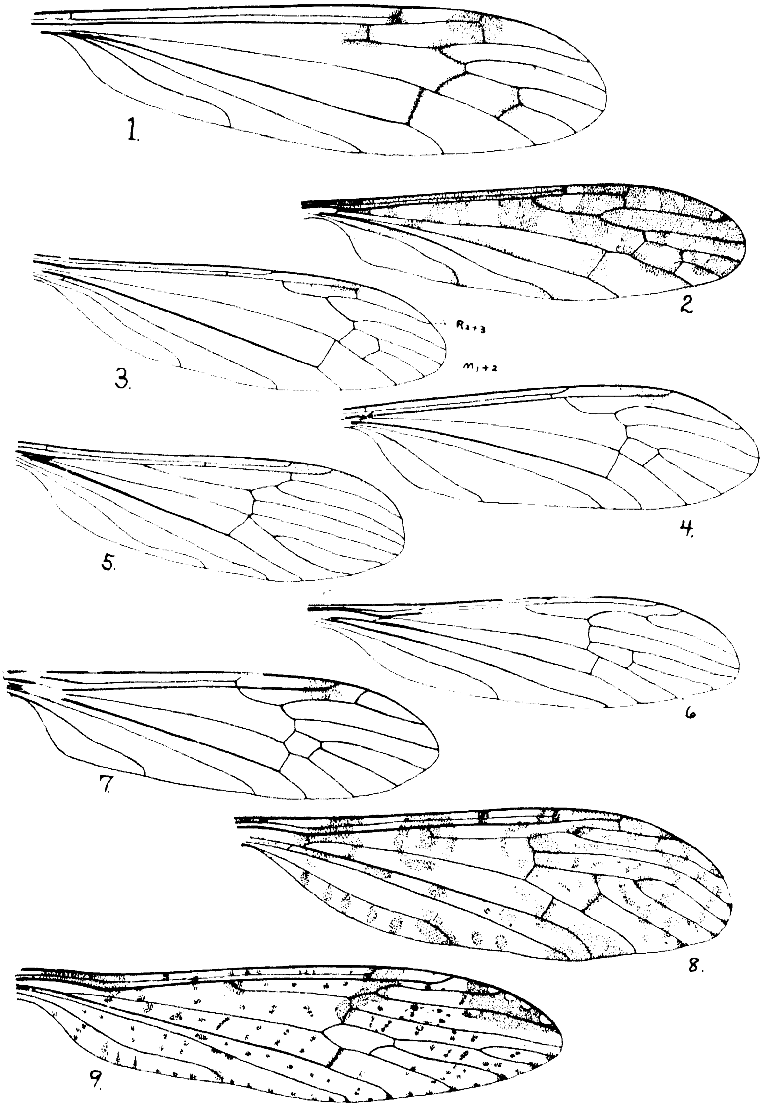
Fig. 5. Wing of *Pachyrhina alleni* n. sp.

Fig. 6. Wing of *Tipula mocoa* n. sp.

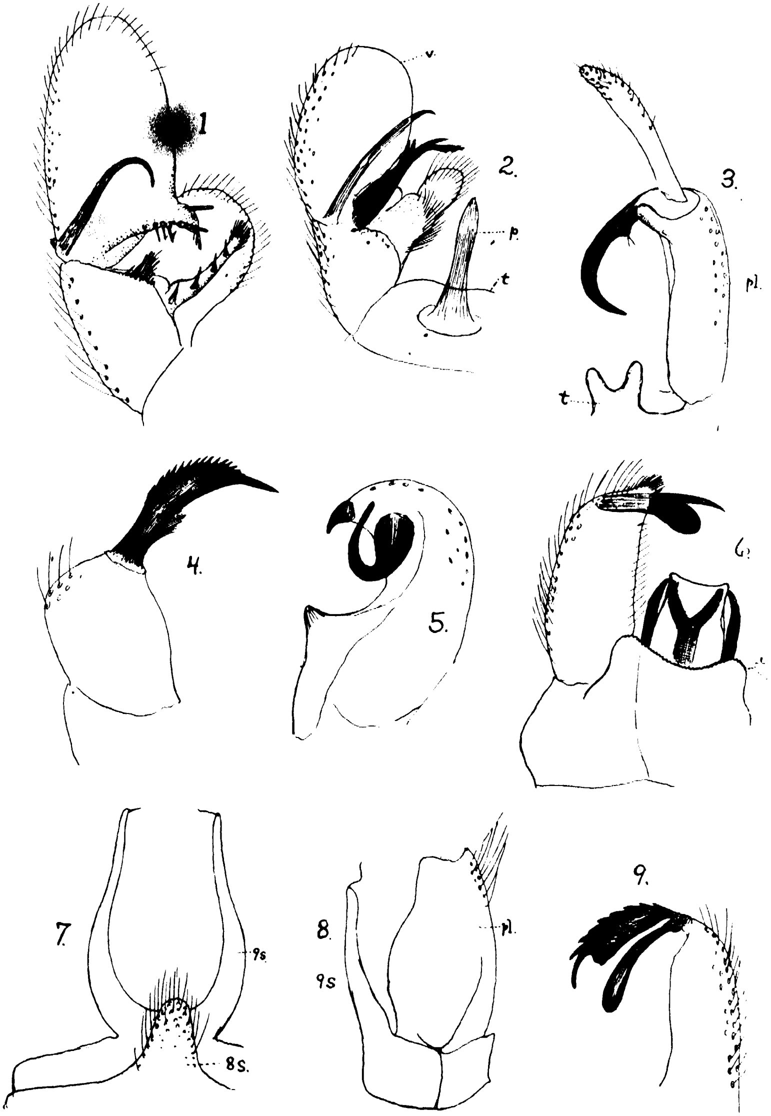
Fig. 7. Wing of *Tipula carizona* n. sp.

Fig. 8. Hypopygium of *Pachyrhina alleni* n. sp. Pleural appendages; o = outer appendage.

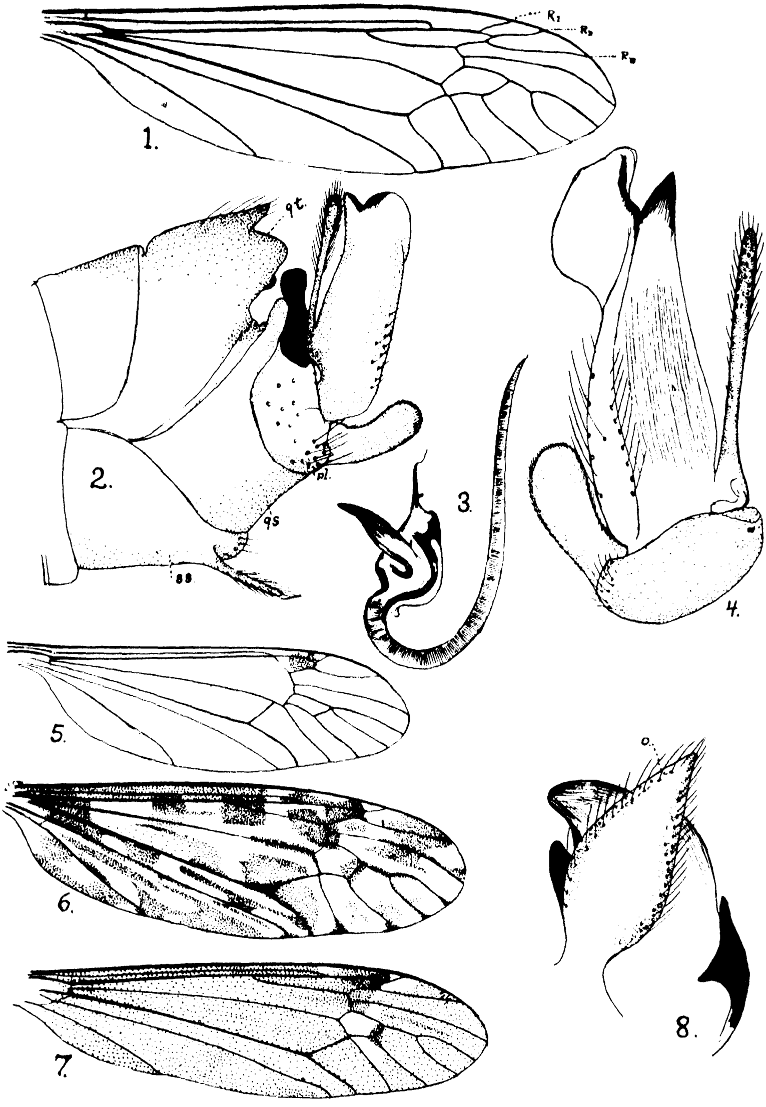
Tipulidæ



Tipulidæ



Tipulidæ



Tipulidæ

DESCRIPTIONS OF GALL MIDGES (DIPTERA).

By E. P. Felt,

Albany, N. Y.

Below we give descriptions of several species of gall midges, all reared, one striking form representing a new genus and species, while the obtaining of adults enables us to make a positive generic reference for a gall which had been known for several years.

Winnertzia aceris new species.

The white larvæ of this midge occurred singly or in small groups under thin decaying bark of a sugar maple at Nassau, N. Y., March 12, 1913, and presented a somewhat superficial resemblance to a sparse *Miastor* colony, except that no mother larvæ were to be seen. The adults, closely allied to both *W. calciequina* Felt and *W. pectinata* Felt, appeared in April. The male of the former has heavy circumfili extending to the basal fourth of the enlargement, while in this new species the basal portion of the circumfili reaches only to the distal third of the enlargement as in *W. pectinata*. The chitinization of these structures is much weaker than in the last-named species, the basal enlargement is more globose than cylindric, and there are also differences in the genitalia. The stem of the penultimate antennal segment in *W. calciequina* is greatly reduced, making the 14th segment nearly sessile, a condition not obtaining in this species.

Larva.—Length 3 to 5 mm., white, the head slender, tapering, light brown. Antennæ large, biarticulate, the distal segment somewhat expanded; breastbone slender, dark brown, the anterior extremity paler, broadly rounded and somewhat expanded. This structure appears to be obsolescent in some specimens. Body segments moderately distinct, the skin finely lined longitudinally and with transverse bands of spines similar to those of *Miastor* at the incisures; terminal segment with submedian lobes, each with a slender, curved, chitinous process apically.

Male.—Length 2 mm. Antennæ nearly as long as the body, sparsely haired, dark brown; 14 segments, the fifth with a stem ¾ the length of the subglobose basal enlargement, which latter has a length ½ greater than its diameter; circumfili extending only to the distal third of the enlargement; penultimate segment with a well developed stem; terminal segment produced, with a length nearly three times the diameter, tapering to a narrowly rounded

apex. Palpi; first segment subquadrate, second with a length fully three times the diameter, the third a little longer, more slender, the fourth nearly twice the length of the third. Mesonotum yellowish brown, sparsely haired. Scutellum, postscutellum and abdomen a nearly uniform fuscous yellowish, the halteres somewhat lighter. Coxæ and femora yellowish white, tibiæ yellowish, tarsi fuscous yellowish, darker apically; claws moderately slender, unidentate, the pulvilli short, with a length over twice the diameter and apically a pectinate spur; dorsal plate long, triangularly emarginate, the lobes broad, obliquely truncate and sparsely setose.

Female.—Length 2 mm. Antennæ extending to the second abdominal segment, sparsely haired, fuscous yellowish; 14 subsessile segments, the fifth with a length 2½ times the diameter, the circumfili extending to the basal fourth; terminal segment reduced, subconical. Palpi; first segment with a length three times its width, second a little longer, broader, the third ½ longer than the second, the fourth nearly twice the length of the third, dilated apically. Face and mouth-parts fuscous yellowish. Mesonotum fuscous yellowish. Scutellum yellowish, postscutellum fuscous yellowish. Abdomen mostly light fuscous yellowish, the ovipositor apically fuscous, its lobes yellowish. Halteres, coxæ and femora basally yellowish transparent. Ovipositor nearly as long as the body, the lobes triarticulate. The basal segment irregularly quadrate, the second suboval and nearly fused with the third, which latter tapers to a narrowly rounded apex. Type Cecid *a*2381.

Camptomyia tsugæ new species.

This large midge was reared in March from yellowish orange larvæ found under the bark of hemlock, *Tsuga canadensis,* bored by the spotted hemlock borer, *Melanophila fulvoguttata* Harr., and forwarded to this office by Herman W. Merkel, of New York. The female, when at rest, carries the antennæ slightly curved and nearly at right angles to the support, the slender ovipositor being recurved over the back. A gravid female contained about 40 eggs, each approximately .12 mm. long, narrowly lanceolate and so arranged within the body as to give, by transmitted light, a "herring-bone" effect.

Larva.—Length about 6 mm., yellowish orange, with a slender, distinct breastbone. Head stout, the margins rather heavily chitinized, the antennæ biarticulate, stout, moderately long. Skin smooth, the posterior extremity bilobed, each lobe with a dorsal, slightly recurved, chitinous process.

Male.—Length 3.5 mm. Antennæ ½ longer than the body, thickly haired, fuscous yellowish, the stems whitish transparent; 27 segments, the fifth with a stem ¼ longer than the cylindric basal enlargement, which latter has a length ½ greater than its diameter; distal whorl of setæ long, stout. Penultimate segment reduced, subsessile, the terminal segment narrowly oval. Palpi: first segment subrectangular, the second a little longer, stouter, the third ¾

longer than the second, and the fourth a little longer and more slender than the third. Mesonotum yellowish brown. Scutellum and postscutellum yellowish orange. Abdomen sparsely haired, reddish orange, the distal segments and genitalia fuscous yellowish. Halteres yellowish orange, reddish apically. Coxæ and femora basally pale straw, the distal portion of femora, tibiæ and basal tarsal segments fuscous straw, the three distal tarsal segments mostly yellowish straw. Claws unidentate, the pulvilli about as long as the claws. Genitalia: basal clasp segment long, subtriangular; terminal clasp segment long, subfusiform; dorsal plate short, broad, slightly and roundly emarginate, the lobes short, broadly rounded; ventral plate long, divided, the lobes narrowly rounded. Harpes slender, narrowly rounded apically, setose.

Female.—Length 3.5 mm. Antennæ nearly as long as the body, sparsely haired, fuscous yellowish; 27 segments, the fifth with a stem 1.4 the length of the cylindric basal enlargement, which latter has a length about twice its diameter and is sparsely clothed with stout setæ; terminal segment somewhat produced, conical and partly fused with the penultimate. Palpi: first segment short, second subquadrate, with a length thrice its diameter, the third twice the length of the second, the fourth a little shorter and more slender than the third. Mesonotum fuscous yellowish, sparsely haired, the submedian lines yellowish. Scutellum reddish orange, postscutellum fuscous yellowish. Abdomen reddish orange, the stout ovipositor fuscous yellowish, about half the length of the abdomen and recurved dorsally; terminal lobes triarticulate, the basal irregular, the second subquadrate, the apical narrowly oval, all sparsely setose. Claws unidentate, the pulvilli as long as the claws. Type Cecid *a*2375.

Dasyneura cercocarpi new species.

The midges described below were reared April 21, 1913, from an imbricated bud gall on *Cercocarpus parvifolius*, collected the preceding October by Professor E. Bethel at Golden, Col. The female of this species runs in our key next *D. flavoabdominalis* Felt, while the male approaches in characters *D. aromaticæ* Felt.

Gall.—8 to 10 mm. in diameter, elongate, oval, white or slightly brownish and thickly tomentose. This gall is an arrested, imbricated bud containing several larvæ.

Larva.—Length 2 mm., reddish orange. Head moderately large. Antennæ tapering, with a length fully three times the diameter; breastbone well chitinized, bidentate, the teeth triangular. Skin coarsely shagreened, posterior extremity broadly rounded.

Male.—Length 1.5 mm. Antennæ nearly as long as the body, sparsely haired, dark brown; 16 segments, the fifth with a stem as long as the cylindric basal enlargement, which latter has a length ½ greater than its diameter; terminal segment reduced, narrowly oval. Palpi: first segment irregular, the second with a length nearly three times its diameter, the third ½ longer and more slender, the fourth ¼ longer than the third. Mesonotum shining brown-

ish black, the submedian lines sparsely haired. Scutellum reddish brown, postscutellum darker. Abdomen sparsely haired, yellowish red, the dorsal sclerites dark reddish brown. Genitalia fuscous. Wings hyaline, costa dark brown. Halteres yellowish basally, reddish apically. Coxæ, femora and tibiæ fuscous yellowish, the tarsi somewhat darker; claws slender, unidentate, the pulvilli as long as the claws. Genitalia: basal clasp segment long, slender; terminal clasp segment short, stout; dorsal plate long, broad, deeply and triangularly emarginate, the lobes divergent, tapering, narrowly rounded; ventral plate rather long, moderately broad, deeply and roundly emarginate, the lobes narrowly triangular, obtuse and sparsely setose apically. Harpes thickly setose and minutely dentate apically.

Female.—Length 1.75 mm. Antennæ extending to the third abdominal segment, sparsely haired, dark brown; 15 or 16 sessile segments, the fifth with a length ¾ greater than its diameter, the terminal segment either reduced and conical or compound and composed of two closely fused and greatly reduced segments. Mesonotum shining black. Scutellum and postscutellum fuscous orange. Abdomen sparsely haired, mostly deep red, the dorsal sclerites slightly fuscous. Halteres yellowish, the fuscous yellowish, ovipositor as long as the abdomen, the terminal lobes slender, with a length about four times the width, sparsely setose. Otherwise as in the male. Type Cecid *a*2359.

Dasyneura parthenocissi Stebb.

1906. Jarvis, T. W., Ent. Soc. Ont., 32d Rept., pp. 68–69, Pl. *D*, fig. 7 (without name).

1910. Stebbins, F. A., Springf. Mus. Nat. Hist. Bull. 2, p. 44 (*Cecidomyia?*).

The above name was proposed on the basis of the earlier description by Jarvis, and while there may be some question as to the validity of this earlier characterization, the following descriptions of the various stages will establish the specific name.

The midges described below were reared from a tumid vein swelling very abundant on Virginia creeper, *Psedera quinquefolia,* in early June at Nassau, N. Y., and remarkable because of the pronounced ridges or carinæ generally present. These galls are presumably identical with a more common type of smooth vein swelling known to be widely distributed in New York state and which has been recorded from Guelph, Canada, by T. D. Jarvis. The white or reddish larvæ producing the gall vary in numbers somewhat in proportion to the size of the deformity. They desert the swellings early and evidently hibernate at the surface of the soil in earth, or débris-walled cocoons and fly presumably some time in the spring.

Gall.—Length about 1.5 cm., diameter about 1 cm. The upper surface of the leaf, usually along the midrib, is slightly contracted, while on the lower side there is a turgid lateral swelling usually originating from the midvein and generally (in specimens collected in 1912) showing distinct ridges or carinæ. In some instances series of galls attain a length of 6 or 7 cm. and in a number of cases all of the leaflets of one leaf were infested. In a few instances the attack developed so early as to practically prevent the formation of foliage, though in most cases the leaves attained nearly full size.

Larva.—Length 3.5 mm., white or reddish orange, moderately stout. Head broad, the length being about ¾ the width, the lateral angles produced posteriorly as long, tapering, chitinous processes. Antennæ relatively long and tapering. Skin moderately smooth, subpapillate on the posterior segments, the segmentation moderately distinct, breastbone bidentate, the shaft irregularly chitinized and subobsolescent, posterior extremity broadly rounded.

Cocoon.—Length 2 mm., oval and covered with coarse grains of sand.

Exuvium.—Length 2 mm., whitish. Antennal cases extending to the first abdominal segment, the wing cases to the fourth abdominal segment and the leg cases nearly to the extremity of the abdomen. About three fourths of the exuvium protrudes from the cell.

Male.—Length 1 mm. Antennæ nearly as long as the body, thickly haired, dark brown; 16 segments, the fifth with a stem ¾ the length of the basal enlargement, which latter has a length ½ greater than its diameter; penultimate segment with the stem reduced and sometimes partly fused with the narrowly oval, more reduced terminal segment. Palpi: first segment irregularly quadrate, the second ½ longer, the third as long as the second and the fourth ½ longer than the third. Mesonotum dark brown. Scutellum and postscutellum fuscous yellowish. Abdomen reddish brown. Wings with third vein distinctly curved anteriorly. Halteres fuscous yellowish. Coxæ and femora mostly fuscous yellowish. Tibiæ and tarsi dark brown, the pulvilli nearly as long as the claws. Genitalia: dorsal plate deeply and roundly emarginate, the lobes narrowly rounded ventrally; ventral plate deeply and roundly emarginate, the lobes long, fingerlike. Harpes produced, irregularly dentate apically.

Female.—Length 1.25 mm. Antennæ about half the length of the body, sparsely haired, dark brown; 17 sessile segments, the fifth with a length ¼ greater than its diameter, the terminal segment slightly reduced. Palpi nearly as in the male, except that the fourth segment is nearly ¾ longer than the second. Mesonotum fuscous. Abdomen dark reddish brown. Coxæ yellowish orange. Ovipositor about as long as the body, the terminal lobes lanceolate, with a length about three times the diameter. Otherwise as in the male. Type Cecid *a*2293.

ASTRODIPLOSIS new genus.

This member of the trifili is separated from its allies by the uniarticulate palpi, the well-developed circumfili, the normal mesonotum and the peculiar genitalia. Though apparently allied to the Argentine

Cystodiplosis Kieff. & Jörg. by the reduced palpi and the third vein uniting with the margin well beyond the apex, it is easily distinguished therefrom by the wings not being very long, the rudimentary pulvilli and the quite different genitalia. The type is *A. speciosa* n. sp.

Astrodiplosis speciosa new species.

The midge described below was reared from an irregular stem gall on an unknown vine collected at Puerto Barrios, Guatemala, March 20, 1913, and forwarded to us through the courtesy of Professor E. Bethel, Denver, Col. The species is easily distinguished by its brilliant orange yellow color and strongly contrasting black markings upon both the wings and legs.

Gall.—Length 2 to 9 cm., diameter approximately 2 cm. This is an irregular, gouty stem swelling composed of tumid soft tissues containing here and there irregularly oval cells with a diameter of approximately 2 mm.

Larva.—Length 3.5 mm., moderately stout, tapering slightly at both extremities, yellowish white and with abundant white adipose tissue. Head small, broad, the sides, the indistinct tips of the mouthparts and apparently the labial margins being chitinized. Antennæ stout, uniarticulate, with a length ½ greater than the diameter. Skin coarsely shagreened; breastbone small, bidentate, posteriorly either weakly chitinized or transparent, and a little behind it two indistinct, slightly diverging, black lines. The posterior body segment is stout, much constricted and with a length approximately ½ greater than its diameter.

Exuviæ.—Length 4 mm., light yellowish brown, the antennal cases hardly extending to the base of the abdomen and with cephalic processes at the anterior basal angles, the thoracic processes represented by conical, denticulate elevations. Wing cases reaching to the base of the third abdominal segment; leg cases to the base of the fifth. Abdominal segments dorsally, each with a transverse basal row of irregular, stout, somewhat halbert-shaped spines; terminal segment irregular.

Male.—Length 3.5 mm. Antennæ ½ longer than the body, sparsely haired, yellowish transparent or reddish; 14 segments, the fifth binodose, the stems with a length 2½ and 3½ times their diameters, respectively, the basal enlargement subglobose and with well-developed circumfili extending almost to the base of the cylindric distal enlargement, which latter has a length twice its diameter and well-developed circumfili basally and apically, the loops of the latter extending almost to the apex of the segment. Palpi: the one segment has a length 2½ times its diameter and tapers irregularly from a somewhat swollen base. Eyes broadly confluent; the entire body a deep yellowish orange or reddish orange. Wings fuscous, except most of the area lying between the third and fifth veins and extending from the basal fourth

to the apical fifth and irregularly oval spots between the fifth vein and the posterior margin, one on each side of the branch, these being yellowish. Halteres yellowish. Legs mostly a brilliant orange yellow, the femora and tibiæ black-banded apically; claws long, stout, curved at the distal fourth, simple, the pulvilli rudimentary. Genitalia: basal clasp segment moderately long, stout; terminal clasp segment long, stout, smooth, except for a swollen setose area at the external angles on the basal fourth; dorsal and ventral plates apparently missing. Harpes fused to form a chitinized, spinose tube surrounding the style.

Female.—Length 4 mm. Antennæ extending to the third abdominal segment, sparsely haired, pale yellowish or yellowish orange, distally red; 14 segments, the fifth with a stem ¼ the length of the cylindric basal enlargement, which latter has a length three times its diameter, bears low circumfili near the basal fourth and apically, and a scattering, broad whorl of moderately long setæ near the distal third; terminal segment slightly reduced, with a length three times its diameter and apically a stout, tapering process about half the length of the basal enlargement. Ovipositor short, tapering, the terminal lobes narrowly lanceolate, with a length three times the width and sparsely setose. Other characters practically as in the male. Type Cecid *a*2386.

A SYNOPSIS OF THE DIPTEROUS GROUPS AGROMYZINÆ, MILICHIINÆ, OCHTHIPHILINÆ AND GEOMYZINÆ.[1]

BY A. L. MELANDER,

PULLMAN, WASHINGTON.

There need be no apology offered for the issuance of the following paper. Our species have been neglected; many of the commonest forms remain unidentified; there is no adequate tabulation of the species or even of the genera, and the determination, therefore, of a species necessitates laborious searching among scattered descriptions; furthermore, a surprising number of European species occur also in America. Although based almost entirely on my own collection, and therefore necessarily far from a complete treatment, this contribution brings to light so many species new to America as to justify its ap-

[1] Contribution from the Zoölogical Laboratory of the State College of Washington.

pearance in print. It will at least serve to unify our present knowledge of this series of important groups.

The species discussed in this paper are those grouped in the Agromyzidæ and Geomyzidæ of Williston's Manual. These small flies belong to that division of the Acalyptrate Muscidæ where the auxiliary vein is more or less rudimentary, ending, together with the first longitudinal vein, distinctly before the middle of the wing; the basal cells small and manifesting a tendency toward becoming incomplete, but the anal cell almost always formed, although never produced. The head is spherical or hemispherical, conical only in *Selachops;* is schizometopic, which means that the frontal orbits are continuous with the facial orbits and with the genæ; the orbital bristles descend to below the middle of the front; the center of the face is usually depressed below the level of the orbits, and is not large nor arched, protuberant only in *Sinophthalmus;* the arista is rarely loosely and long plumose, is usually quite bare, but ranges to long-pubescent or even plumose; the scutellum has protuberances only in *Rhodesiella;* the posthumeral bristle is regularly absent; the legs are never greatly lengthened and very rarely thickened; the tarsi are always slender, with the metatarsus the longest joint. The oral vibrissæ may be present or absent, the wings may be pictured or not, the body may be stout or rather slender; the color may be dark or light, and the proboscis may be long or short. The vestiture may consist of a dense pruinosity or the insect may be highly polished, while the body may have many or few bristles, or may be clothed with hairs.

While the limits of the combined group here discussed are relatively easily fixed, there being but few genera that have been questioned,[1] it has not proved so easy to define the boundaries of the subfamilies within the group. Various writers have reassigned doubtful genera here and there, as will be seen in their discussion at the close of this introduction.

Hendel and Czerny, recognizing the importance in phylogeny of hidden characters that have not been influenced by the mode of life of the species, have proposed the most satisfactory outlines of the subfamily limits, emphasizing such apparently trivial but ancestral char-

[1] *Siligo* Aldrich was described as a Helomyzid; *Pelomyia* Williston as an Ephydrid; *Eusiphona* Coquillett as a Tachinid; *Lestophonus* Williston as an Oscinid.

acters as the convergence or divergence of the minute postvertical bristles, the manner of fracture of the basal portion of the costa, and the intimate structure of the interfrontalia of the head. The form of the proboscis, the structure of the legs, the venation, particularly of the outer part of the wings, and the style of vestiture have been too recently modified, as measured in biologic time, to be of much service in indicating the interrelationships of subfamilies.

As will be noted the following analytical table makes use of characters that are not customarily employed and which require considerable magnification for their discernment. A few words will be needed to explain the terminology adopted. The structure of the cheeks, face and front has proved of great assistance in determining subfamilies: not the general shape, but the vanishing details of the proportions of the sclerites making up the head. The cheeks, that lateral portion between the eyes and the mouth, are a complex of several sclerites. Nearest the eye, the facial orbits, what the Germans designate as Wangen, descend from in front, their delimiting suture continuing straight downward or obliquely backward or even parallel with the eye-margin before it vanishes. This part of the cheek, nearest the eye, I have designated the gena, following Dr. Hough's selection of this term in his Muscidæ of Somaliland, 1898.[1] Next to the gena lies a varying-shaped piece, called by the Germans the Backe, and by Dr. Hough the bucca. The oral vibrissa is always located near the lower front angle of this piece, but the shape of the sclerite varies greatly. In the Opomyzinæ it is linear and parallels the narrow gena; in the Milichiinæ it is triangular, owing to an oblique extension forward of the lower occiput, in which case the cheek consists largely of this part of the occiput. Where the relative breadth of the bucca and the gena is called for the measurement should be made near the vibrissal angle, but, since the suture between these sclerites vanishes, its course may need to be projected as a continuation of that part present. In many of the Geomyzinæ the lateral prolongations of the center of the face are visible beneath the buccæ, thus forming the real margin of the mouth. These four sclerites which enter into the composition of the cheeks, probably originally sharply differentiated, are

[1] The term *gena* is in Greek *geneion,* in Italian *guancia,* in Spanish *mejilla,* in French *joue,* and in English *jowl,* but these cognates indicate merely the cheek in a generic sense.

now in such a state of fusion that their discernment is rendered a matter of some difficulty, requiring the use of a compound microscope.

For many years the Acalyptrate Muscidæ have been lined up in two groups according to the course of the auxiliary vein. The distinctness with which this vein is separated from the first longitudinal is at most a matter of relativity, but since the auxiliary vein is an ancestral relict in a modern group of insects, its course does serve to interpret phylogeny. Heretofore the auxiliary vein has been cursorily looked at and has been accounted absent when there is no distinct chitinization. A close examination, both by transmitted and by reflected light, reveals a fold in the wing membrane even where the vein is lacking, and thus the former course of the vein can be determined. For exactness this part of the wing must lie flat in the field of vision. Moreover, the costa is frequently broken at the end of the auxiliary vein, whether the vein itself is present or not, and, therefore, the exact position of the costal break affords a valuable clue to the ancestral history of these flies. Just beyond the humeral crossvein the costa may be again broken, clearly discernible by transmitted light, the break occurring where some of these flies, such as *Stegana* and *Drosophila,* still fold down their wing. A distinct break at this place is characteristic of the Milichiinæ, Drosophilinæ and Ephydrinæ, but does not occur in any of the Agromyzinæ, Ochthiphilinæ, Geomyzinæ, and several of the other groups. As a single character this costal fracturing is probably as weighty as any.

The lengths of the crossveins as compared with the segments of the longitudinal veins, the proportions of the sections of the costa, and the course and termination of the longitudinal veins are all variable within certain limits, but are useful characters for less than generic determination. The shape of the calypter and the character of its fringe of cilia, the form of the alula and of the anal angle of the wing, the extent of the basal cells and of the anal vein, the position of the crossveins, the origin of the third vein, the strength of the fourth and fifth veins in particular, the hairiness of the basal section of the costa, all offer characters of more than generic value, probably having been under less rigorous selection than structures in the outer part of the wing.

Naturally, chætotaxy is important here, as it is in related Muscidæ. Not only the number of bristles and their exact location but even their

inclination must be observed. This is particularly true of the bristles on the front. The presence or absence of the anterior dorsocentrals, of the presutural, of the sternopleural, mesopleural, and rarely of the pteropleural, the number and direction of the scutellars, require notice. The postverticals, oral vibrissa, preapical tibial bristles, acrostichal and mesopleural setulæ, prothoracic bristles and the hairs of the second antennal joint are taxonomically important. The ocellars, vertical bristles, occipital, supra-alar, coxal, femoral and abdominal bristles are less utilized. However, any of the bristles may vary, and absolute stress should not be laid on the presence or absence, size or inclination of certain of the hairs. Within reasonable limits the chætotaxy is reliable and offers a most valuable guide to the genera and species.

Within the group the proboscis is quite variable. It is twice broken, the basal and end sections directed backward, the middle section forward. Sometimes it is short and largely fleshy (*Meoneura, Chiromyia*), again it is elongate, slender, strongly chitinized and resembles a piercing organ (Milichiina). Even where it is of medium size the labella may be broad and fleshy (*Rhicnoessa*) or may be needle-like (*Desmometopa*). The palpi range from large and porrect to small. Their shape and hairiness should be noted. The development of the clypeus (variously called the prelabrum, upper-lip, fulcrum, pharynx, Schlundgerust, Chitinhufeisen) is important. Hendel restricts the term clypeus to the center of the face (antennal foveæ, Gesichtsleiste), a structure which still lacks a convenient English name. The center of the face is bounded by the facialiæ or facial ridges, which are more or less evidently separated from it and from the genæ. Sometimes the front is complex, with paraorbits, interfrontalia, ocellar triangle, cruciate bristles, and specialized stripes (Chitinleisten) between the paraorbits and the ocellar triangle, all of which may be present (*Desmometopa*), marking the front with a letter M. Sometimes the front is simple, pollinose or not, but with the ocellar protuberance alone differentiated. The shape of the lunule is also noteworthy.

The shape and hairiness of the third antennal joint and less so of the second; the development of the arista, whether slender, elongate, pubescent, or with small or large basal segment; the excavation or convexity of the upper occiput, and the profile of the head should be noted. Less important is the structure of the thorax, abdomen and

legs.. The hypopygium is enlarged only near *Tethina,* and the ovipositor is specialized rarely outside of the Agromyzinæ, where it is cuneiform or tubular. However, the number of abdominal segments is not constant, and should be observed.

In describing genera these preceding characters should be mainly noted. Meigen, Zetterstedt, Schiner and Loew lived before the days of chætotaxy and their descriptions are hard to interpret into the following tables. These tables have been constructed from what specimens I have had to study, and I am not answerable for the correct assignment of those genera I know only from descriptions. However, my collection of this group includes thirty-seven genera, one hundred and sixty-five species and about two thousand specimens, mainly, of course, North American, and without such a representation this work would have been impossible. The lack of definite information in the older descriptions concerning characters now considered important has made it necessary at times to select characters that we would not willingly stress. The identification tables are thus largely artificial; some of the groups seem natural and phyletically related, but often the association of genera and species in the tables is due to the arbitrary emphasis of some selected character. All the genera hitherto known, the world over, are included in the tables of genera, but only the species known to occur in North America are given in the tables of species. In presenting them I trust that the tables will be workable, and that they will help and not hinder other students in unraveling the intricate species of this little known group.

The nearest relatives of the species herein discussed are the Drosophilinæ, Oscininæ and Ephydrinæ. In fact, the Geomyzinæ are more nearly related to the Drosophilinæ than they are to the Agromyzinæ. *Acarthrophthalmus* of the Heteroneurinæ closely resembles the Agromyzinæ, but its auxiliary vein is more distinct and separate from the first vein and the break in the costa is near the humeral crossvein.

The accompanying tabulation of characters is given for the principal groups with which the species discussed herein might be confused. In explanation, the sclerites comprising the cheeks, the lower occiput, gena, bucca and center of the face are abbreviated *O, G, B* and *F,* respectively, and the most important one is mentioned first. Where there is but one costal break it occurs near the end of the

	Geomyzinæ.	Agromyzinæ.	Melichiinæ	Ochthiphilinæ.	Drosophilinæ.	Oscininæ.	Ephydrinæ.	Heteroneurinæ.	Psilinæ.
Costa broken	Once	Once	Twice	None	Twice	Once	Twice	Not, or once	Once
Auxiliary vein ending in	Costa	1 vein usually	Costa	Costa	Rudimentary	Rudimentary	Rudimentary	Costa	1 vein
Anal cell	Present	Present	Present	Present	Present	Absent	Absent	Present	Large
Basal vein of discal cell	Present	Present	Present	Present	Usually absent	Absent	Absent	Present	Present
Anal vein	Base present	Base present	Rudimentary	Base present	Base present	Absent	Absent	Base present	Present
Cilia of calypteres	Loose to rudimentary	Dense	Rudimentary	Abundant	Rudimentary	Variable	Variable	Loose	Loose
Cheek consisting of	G.B.F.	B.W.	O.B.G.	G.B.F.	G.B.F.	B.G.	G(B)F.	O.G.B.	O.G.B.F.
Clypeus	Large	Small	Small	Small	Large	Rudimentary	Very large	Small	Small
Interfrontalia differentiated	Present or absent	Small	Large	Not	Large	Large		Small	Small to large
Frontal orbits differentiated	Usually absent	Often present	Present	Absent	Present	Absent	Present	Absent	Absent or present
Center of face	Inset	Flat	Sunk	Flat	Concave		Raised	Concave	Flat
Postvertical bristles	Converging	Diverging	Converging	Converging	Converging	Converging	Converging	Diverging	Diverging or wanting
Oral vibrissa	Present or absent	Present	Present	Absent	Present	Absent	Absent	Present	Present
Foremost orbital bristle	Reclinate	Convergent	Convergent	Reclinate	Proclinate	Wanting	Divergent	Various	Wanting
Interfrontal bristles	Absent or present	Absent	Present	Absent	Rare	Absent	Present or absent	Present or absent	Absent
Prothoracic bristle	0–2	1	Absent	Absent	Absent	Absent	Absent	1 or 0	Absent
Mesopleural bristles	Present	Present	Rare	Absent	Absent	Absent	0 to several	Present	Absent
Arista	Pubescent	Closely pubescent	Loosely pubescent	Bare	Plumose	Sub-bare	Bare to plumose	Sub-bare to plumose	Pubescent

auxiliary vein, except in *Acarthrophthalmus* as noted above: where the costa is twice broken the first fracture is near the humeral cross-vein and the second at the end of the auxiliary vein. This tabulation is not infallible, but gives the characters usually and typically found. It is often a difficult matter to know to what subfamily of the smaller Muscidæ a specimen should be assigned. The tabulation may therefore be found useful in verifying an identification.

In glancing over the enumerated species it will be noted that *Agromyza* is by far the dominant genus, followed by *Phytomyza,* which is a close relative. The remaining genera have but one or a few species. The characters by which many of the smaller genera are distinguished, such as the number of fronto-orbitals or dorsocentrals, the shape of the cheeks and the size of the eye, have a range of variability in *Agromyza* equal to that found in a series of the small genera, but can not be utilized for the segregation of this complex genus. In *Agromyza*, especially, the profile of the face can not be relied on too strictly. Apparently the drying of the head vaults the mouth-opening so that the epistome at times is projected more than at others and thus in some specimens it becomes visible in profile. The shape of the lunule may likewise change, according to the age of the specimen. In this genus *Agromyza* it is often impossible to determine what are varietal and what are specific limits. For instance, couplet 59, separating *melampyga* and *scutellata* is unsatisfactory, containing characters most trivial than some of the varietal characters given under those species. Extreme variations, like the black *orbona* and the yellow *melampyga,* would appear obviously distinct, but the other forms exhibit gradations connecting these extremes in every particular. The discal cell varies from small to medium, the width and shape of the front is inconstant, the maculation of the body and legs ranges over almost the entire gamut of coloration in this genus, so there is little that is tangible to use in limiting the species. Under such circumstances my determinations can not be considered infallible, but with determined European material before me for comparison the identifications given may be utilized until the type material is compared with larger collections of specimens. It is not unlikely that the less ornate species are similarly variable and that the number of described species will be materially reduced when much larger collections are studied. In several instances in the dichotomy I have

grouped a number of characters that are correlated in the specimens before me. The descriptions of the older authors are often silent regarding some of these characters, *e. g.*, the color of the calypteres, the number of fronto-orbitals or dorsocentrals, the details of venation, etc. Rather than encumber the key with repeated statements that the correlation of characters is based on the specimens studied and is not known to hold in those species that I do not possess, I have left it for the list of localities to indicate those species I have, and those concerning which there might be doubt. The localities include, in addition to places already recorded, the localities of specimens in the collections of Dr. Garry deN. Hough, now at Chicago University, and of Professor J. M. Aldrich. Those places from which I possess specimens are marked with a star (*).

While in the preparation of this paper I have depended almost entirely on the material in my own collection, still I wish here to express my appreciation of the good-will of my friend, Professor Aldrich, who has always been ready to share his collection and library whenever asked. For some years our common interest in these flies has brought out many inductions that working independently we might have missed. Mr. Charles W. Johnson has also generously sent his species of *Spilochroa* for examination.

The work on these small flies has practically all been done under the Zeiss prism binocular microscope, using mainly the a_3 objective and number 1 ocular. While a magnification of but thirty-one diameters is thus produced, the clearness afforded by stereoscopic vision has certainly repaid the extra labor of centering the specimens in the field of the microscope. Indeed, the hand lens has been practically discarded as incapable of resolving such difficult characters as the fracturing of the costa or the boundaries of the sclerites of the head. In this connection I wish to call attention to the insect holders, made by the Spencer Lens Company and the Ernst Leitz Company, a ball and socket attachment that easily enables a specimen to be viewed in any position under the microscope. For extra illumination needed in deciding difficult points I have attached over the field of the microscope a small low-voltage tungsten automobile headlight. By placing the lamp beyond the focal point the parabolic reflector concentrates the light on the specimen. A step-down transformer furnishes low voltage and a small rheostat regulates the intensity of illumination,

which can thus be instantly changed from a glow to twenty-five candle power.

A few genera which have not found their final resting place in the present systems of classification are discussed in the following notes. The first five of these genera are not included in the table of genera, the other three are.

Aulacigaster Macquart, which has been variously assigned to the Agromyzinæ, Geomyzinæ, Drosophilinæ and Ephydrinæ, has the second basal cell confluent with the discal, the anal cell well-formed, the auxiliary vein relatively distinct and entirely separate from the first vein, the costa broken at the humeral crossvein and again at the auxiliary vein, the clypeus very large, the center of the face continuing laterally under the buccæ so as to comprise a large part of the cheeks, the anterior fronto-orbitals proclinate and the postverticals convergent. This combination of characters clearly places it in the Drosophilinæ notwithstanding its bare arista. The West Indian species figured by Williston in his Manual, page 292, agrees with *rufitarsis* except that the auxiliary vein ends in the first in Williston's figure and the arista is pubescent.

Cyrtonotum Macquart has the costa twice broken. The structure of the orbital bristles, the face, cheeks and mouth is also like that of the Drosophilinæ.

Leiomyza Macquart was reported by Williston, Entomological News, vii, page 185, from America, but no species was described. Becker places this genus with *Aulacigaster* in the Drosophilinæ. I have no specimens and so have no opinion to offer.

Lipochæta Coquillett, which Williston once referred to the Ochthiphilinæ, has the costa twice broken. It is a curious Ephydrid.

Sephanilla Rondani, described from Italy in 1874 and not since reported, was placed by its author with *Leucopis* and *Ochthiphila*. It is, however, a shining black species, the front with a transverse yellow band above the antennæ, the mouth-parts, antennæ, halteres and legs in part light-colored. The lack of pruinosity, the basal position of the crossveins and the course of the auxiliary vein would indicate a Geomyzid or perhaps a Sapromyzid. It is not sufficiently characterized to find a place in the table.

Pseudopomyza Strobl, located by the author in the Drosophilinæ or Geomyzinæ, is placed by Hendel close to *Desmometopa*.

Hendel's figures show the proboscis to be like that of *Rhicnoessa* and the wing like that of *Desmometopa*. It is included twice in the key to the genera in order to avoid confusion.

Rhicnoessa and **Tethina** have been variously shifted. The front sometimes possesses hairs similar to the cruciate bristles of the Milichiinæ, in which group they have usually been tabulated, but the structure of the face and cheeks is very much like that found in the Geomyzinæ. With the latter group they find their best location, as is shown by the single break in the costa, the pollinose body and especially the pollinose front, the more or less excavated occiput, and the strong bristles, particularly of the pleuræ, such as the paired prothoracic and the row along the posterior side of the mesopleuræ. However, the auxiliary vein terminates in the first vein leaving the break in the costa close to the end of the first vein, and not some distance before, as is otherwise the case in the Geomyzinæ before me, while the chitinized and lengthened proboscis and the sometimes prominent visbrissal angles show great similarity to Milichiine characteristics. Professor Aldrich first suggested to me the identity of *Pelomyia* Williston with *Tethina*.

TABLE OF SUBFAMILIES.

Auxiliary vein separated from the first vein, sometimes touching it before the end and then again separating so as to end much before the termination of the first vein; postverticals convergent or wanting; costa complete, at most slightly weakened just before the end of the auxiliary vein; densely gray-pruinose species, abdomen usually pictured with brown or black spots; oral vibrissæ wanting or not differentiated; frontal suture transverse, not highly arched: interfrontalia differentiated only by a difference in color or sheen of the pollen, without cruciate inner frontal bristles, the ocellar triangle pollinose; occiput flattened; oral margin not deeply excised in front, center of the face broad, relatively flat and not impressed beneath the plane of the orbits, no vibrissal angle; genæ and buccæ of cheeks not differentiated; proboscis short, not bent back at the end; prothoracic bristles wanting; one posterior sternopleural; mesopleuræ usually bare, rarely with sparse setæ; front femora with a series of uniform bristles on the outer flexor edge; no preapical bristles on tibiæ, middle tibiæ with apical spur; calypter large, ciliate; anal angle of wing well developed, anal vein entirely rudimentary, basal cells complete..OCHTHIPHILINÆ.

Auxiliary vein fused with the first vein for much of its length, or entirely rudimentary; costa broken at least before the end of the first vein;

rarely silvery-gray pruinose; oral vibrissæ often present; frontal suture usually arched, sometimes flattened........................2.

2. Costa broken twice, once beyond the humeral crossvein at which place there is usually a stronger costal bristle, and again just before the end of the first vein; hairs of oral margin borne wholly or largely on the lower occiput which arches forward under the eye, the genæ greatly reduced, leaving the buccæ more or less triangular, with the oral vibrissa at its front angle; face in profile concave, the vibrissal angle often prominent and projecting as far as the level of the frontal suture; a double row of cruciate bristles present along the middle of the front, borne sometimes on specialized stripes, the interfrontalia often evident and formed from the enlarged ocellar triangle; oral margin often arched in front; proboscis geniculate, and usually lengthened, the labella rarely fleshy; postverticals convergent, rarely parallel or wanting, but never divergent; anterior dorsocentrals, prothoracic, and mesopleural bristles rarely present; calypter small, rarely densely ciliated; anal vein entirely rudimentary or wanting.

MILICHIINÆ.

Costa not, or but very rarely, broken at the humeral crossvein, and without corresponding bristle; bucca quadrangular or linear, or if triangular usually broader behind, the occiput rarely reaching forward on the cheeks, the hairs of the oral margin therefore together with the vibrissa borne by the bucca; face retracted or the vibrissal angle not evident, produced only in some species of *Rhicnoessa* and *Tethina;* front usually devoid of cruciate bristles, though sometimes hairy; ocellar triangle usually reduced, insect often pollinose; oral margin not highly arched in front; proboscis short, usually very short, labella rarely chitinous; prothoracic and mesopleural bristles usually present; calypter usually large and densely ciliate; base of anal vein usually evident ....3.

3. Postverticals divergent, rarely wanting; basal joint of arista minute, shorter than broad, the remainder of the arista closely short-pubescent; auxiliary vein, though rudimentary, usually ending in the first vein instead of in the costa (sometimes, *e. g., Phytomyza, Cryptochætum,* the auxiliary vein parallels the first vein for its entire course) and rarely (*e. g., Agromyza* spp.) it approaches the first for a short distance to bend away at the tip; the break of the costa at the end of the auxiliary vein, therefore, usually just in front of the termination of the first vein; genæ narrower than the buccæ (except in *Phytomyza* spp.); upper occiput not deeply concave; prothoracic bristle single.

AGROMYZINÆ.

Auxiliary vein more or less distinct from the first vein and ending separately in the costa at a greater distance from the first vein than its separation from it along the middle of its course, rarely the end of the auxiliary vein has completely vanished, in which case the fracture of the costa some distance before the ending of the first vein indicates

its former course (in *Rhicnoessa* and *Tethina* the auxiliary vein ends in the first vein); genæ broader than or as broad as the buccæ; postverticals convergent or wanting; antennal arista often loosely pubescent or plumose, the basal joint always longer than wide, sometimes even elongate and hairy; often the hairs of the oral margin are in more than a single row; upper occiput often markedly concave; prothoracic bristle sometimes paired.....................GEOMYZINÆ.

SUBFAMILY OCHTHIPHILINÆ.

TABLE OF GENERA.

But two posterior dorsocentrals; postverticals wanting; third antennal joint short, reniform, the arista short and rather thick.................2.

Presutural and postsutural dorsocentrals present; postverticals convergent; third antennal joint longer, its upper outer end rather angulate.....3.

2\. Ocellar and fronto-orbital bristles wanting; palpi broad; mesonotum with numerous setulæ; one presutural; second antennal joint bristleless; mesopleuræ and pteropleuræ bare; alulæ large and rather pointed. (Europe, Asia, North America.).................*Leucopis* Meigen.

A pair of ocellar and two fronto-orbital bristles present; second antennal joint with a bristle on the upper side; mesopleuræ and pteropleuræ with sparse setulæ. (Europe.).................*Cremifania* Czerny.

3\. Head flattened, triangular, pointed at the insertion of the antennæ, face nearly horizontal; eyes horizontally oval; wings pictured. (Europe, North America.)...........................*Acrometopia* Schiner.

Head more rounded, front not projecting; eyes rounded, not transverse..4.

4\. Dorsocentrals 1 + 2; no mesopleural bristles; foremost fronto-orbital anterior to the middle of the front; head but little broader than the thorax. (Europe, Asia, North America.)........*Ochthiphila* Fallen.

Dorsocentrals 1 + 3 (or 4); mesopleuræ sometimes with setulæ; foremost fronto-orbital opposite middle of front; head conspicuously broader than the thorax. (Europe.)...............*Parochthiphila* Czerny.

LEUCOPIS Meigen.

Densely gray pruinose species of bluish-white luster, the abdomen more purely white-gray. This pruinosity seems to increase with the maturity of the individual, so that it does not altogether have specific value. I have one specimen, presumably *simplex,* where even the antennæ and palpi are completely coated. The maculation of the abdomen and the distinctness of the thoracic stripes are quite variable. Indeed, it is doubtful if the species listed in the table represent valid species, for there is much gradation. Most of my specimens belong

to *griseola,* a species which has not been hitherto reported from America. Some individuals lack entirely the spots of the abdomen; in others there is a tendency to forming the median stripe of *bella.* Quite probably many of the records of *bella* should be referred to this species. However, *griseola* is reported aphidivorous while *bella* is coccivorous.

TABLE OF SPECIES OF *Leucopis.*

Front tarsi wholly or principally yellow.................................2.

Front tarsi wholly or principally black; thorax with two central linear cinereous black and two other broad brown vittæ; first abdominal segment blackish, the second with a pair of black dots; front bivittate with black; base of antennæ pruinose; legs black or cinereous, the knees and base of posterior tarsi yellow; wings whitish, the costa infuscated. 1–1.5 mm. (Eur.;* Ga.,* La.,* Id.,* Wash.*)........*griseola* Fallen.

2\. Abdomen immaculate, thorax and front not vittate; legs black, the tibiæ at base and tip and the tarsi yellowish; wings hyaline. 1.5 mm. (N. Y., Mass., N. J., N. H., D. C., Va., Ga., Mich., Nebr., Wash.*) *simplex* Loew.

Abdomen more or less spotted; thorax with two brown stripes...........3.

3\. Abdomen with first segment cinereous black, the second segment with a pair of blackish spots, and the rest of the abdomen immaculate; thorax bivittate; center of front gray, the orbits more silvery; antennæ black. 2 mm. (Eur.; N. H., N. J., D. C., Ind., La.,* Tex., N. Mex., Cal.*) ....*nigricornis* Egger.

Abdomen marked with additional spots; antennæ more or less pruinose...4.

4\. Thorax marked with two brown vittæ convergent behind; front bivittate with cinereous black...5.

Thorax not vittate with brown; front cinereous; abdomen with two lateral spots and a median basal vittula of velvety black upon segments 2, 3 and 4. (Nebr.) (Can. Ent., XLII, 241, 1910.)..*maculata* Thompson.

5\. Abdomen with the first segment black except the margins, the second marked with three spots, the third and fourth with a median basal black spot; antennæ cinereous; wings milky. (W. Ind., Fla., Col., Can., Cal., Mex.)..................................*bella* Loew.

Abdomen with the first segment marked with deep brown except laterally and posteriorly, the second, third and fourth segments with a slender subinterrupted stripe and a pair of rounded brown spots, diminishing in size; base of antennæ cinereous; wings hyaline. (Tex.,* N. Mex., Mex., Id.*)..................................*bellula* Williston.

ACROMETOPIA Schiner.

Tibiæ and front tarsi black; third antennal joint three times as long as wide, bluntly rounded; front with a broad brown vitta; abdomen with many

black dots; basal half of wings with five brown dots, apical half with four fasciæ. 2.5 mm. (Ga.) .... *punctata* Coquillett.

Tibiæ and tarsi yellow; third antennal joint less than two times as long as wide, the apical angle nearly rectangular; segments two to five of abdomen each with a basal pair of black dots; wings marked with numerous dots and streaks. - mm. (Cuba.) .... *maculata* Coquillett.

OCHTHIPHILA Fallen.

Hendel (Wien. ent. Ztg., XXIX, 313, 1910) and Coquillett (Type Species N. Am. Gen. Dipt., 1910) prefer the name *Chamæmyia* Meigen, 1803, to the generally accepted *Ochthiphila* of Fallen, changing also the subfamily name to Chamæmyinæ. *Chamæmyia* was given by Meigen in Illiger's Magazine as a genus, with no species mentioned. In 1810 Panzer described *Chamæmyia elegans*, and therefore the genus is usually accredited to him. In view of the present sentiment regarding the overthrow of names in general usage, I regard it unnecessary to discard Fallen's name *Ochthiphila*.

Ochthiphila lispina Thomson, from California, is probably the female of *Schœnomyza litorella* Fallen.

TABLE OF THE SPECIES OF *Ochthiphila*.

Antennæ wholly or in part yellow .... 2.

Antennæ entirely black; palpi dusky .... 4.

2. Third, fourth and fifth segments of the abdomen with broad black fasciæ interrupted in the middle; a vague fascia across the middle of the front, and another narrowly above the lunule; antennæ reddish, the third joint brown above, the arista brownish yellow. 2 mm. (Eur.; N. J.) .... *elegans* Panzer.

Abdomen with round black spots or else entirely unspotted; front not fasciate; arista brown .... 3.

3. Antennæ wholly yellow, sometimes dusky at the base and apex; abdomen usually not spotted, sometimes with small spots on the fifth segment; proboscis and palpi yellow; legs yellow, the femora cinereous black except at the tip. 3 mm. (Eur.; Ont.) .... *maritima* Zetterstedt.

Antennæ black, only the middle yellow; abdominal segments two to five, with paired round black spots, laterally also spotted; palpi blackish, apically yellowish. 2–3 mm. (Eur.;* Mass.,* N. Y.,* Can.,* N. J., Wisc., Ill., Wash.*) .... *polystigma* Meigen.

4. Legs principally black, the knees and hind metatarsi yellow; abdomen with at most three pairs of black spots. 2 mm. (Eur.; Col.) *geniculata* Zetterstedt.

Tibiæ entirely yellow..5.

5. Abdomen usually with three pairs of dorsal black spots, and corresponding lateral spots; arista blackish; legs yellow except the base of the femora cinereous black and the end of the tarsi brown. 2–3 mm. (Eur.;* Mass., Col.*)............................*juncorum* Fallen.

Abdomen entirely unspotted, lacking both the dorsal and the lateral markings. 2–3 mm. (Eur.;* Col.,* Wash.*).............*aridella* Fallen.

SUBFAMILY MILICHIINÆ.

TABLE OF GENERA.

Costa prolonged as a pointed lappet at its break at the end of the auxiliary vein; lower fronto-orbitals bent inward; interfrontal stripes bearing evident cruciate bristles; abdomen often silvery; last section of fourth vein at most two times as long as the preceding section; calypteres with long cilia; cheeks very narrow; mesopleuræ often bristly. (Group MILICHIINA.)..2.

Basal section of costa not overlapping the outer section at the break before the end of the first vein; cruciate bristles sometimes reduced; abdomen rarely silvery; last section of the fourth vein at least three times as long as the preceding section; anterior crossvein beyond the costal break; mesopleuræ rarely with bristles; calypteres rarely with dense cilia. (Group MADIZINA.).......................................7.

2. Hind margin of eye not excised; eyes pubescent.......................3.

Hind margin of eye excised at the level of the antennæ: this may be a narrow excision or may continue to the lower corner of the eye....4.

3. Mesopleuræ bare; proboscis not remarkably developed, palpi spatulate; face broader. (Europe, Africa, Java.)........*Milichia* Meigen, sens. str.

Mesopleuræ with three or four strong bristles; proboscis elongate and geniculate, the outer portion long and directed backward; palpi slender; face narrow. (South America, North America.)
Pholeomyia Bilimek.

4. Mesopleuræ without strong bristles; first segment of male abdomen projecting over the middle of the second segment...................5.

Mesopleuræ with strong bristles; posterior margin of the first segment of the abdomen ♂♀ straight, not medially gripping the second segment; proboscis not lengthened. (South America.)...*Pseudomilichia* Becker.

5. Head and thorax roughened, with fine pubescence; proboscis very long and geniculate. (South America.).......................*Ulia* Becker.

Head and thorax smooth, the hairs and bristles normal; proboscis normal.6.

6. Four dorsocentrals; pubescence of mesonotum scattered and coarse. (South America.)..................................*Eccoptomma* Becker.

One or two dorsocentrals; pubescence of mesonotum close and short. (Europe, Africa, New Guinea, Hawaii, North America, South America.)...............................*Milichiella* Giglio-Tos.

7. Front narrow, nearly three times as long as the width above, with about eleven pairs of uniform fronto-orbitals; first vein ends near the middle of the wing; third and fourth veins converging so as almost to close the first posterior cell; three humeral bristles, one presutural, two small dorsocentrals placed well back; costa almost bare; calypteres rather large, the upper one delicately ciliate; head large, hemispherical, cheeks very narrow, no vibrissal angle; proboscis very long, slender and geniculate; eyes bare. (North America.)..*Eusiphona* Coquillett.

Front relatively broader, never with many large fronto-orbitals; first vein ends nearer base of the wing; first posterior cell never markedly narrowed; calypteres rudimentary............................8.

8. Hairy, almost bristleless, no vibrissæ, fronto-orbitals or scutellars; front, eyes, mesonotum and pleuræ hairy; front below ocelli over twice as long as wide; cheeks one sixth the eye-height; proboscis short and robust. (North America.)..................*Arctobiella* Coquillett.

Not densely hairy species, macrochætæ differentiated; front transverse or quadrate (rarely, *e. g., Platophrymyia, Leptometopa*), longer than wide ....9.

9. Proboscis long, chitinized and geniculate, the outer portion folding back; vibrissal angle of cheeks usually distinct......................10.

Proboscis very short, fleshy, the labella not strongly geniculate, nor constructed for piercing; oral margin not or scarcely projecting, usually several vibrissæ in an oblique row in front.....................22.

10. Arista thickened; third antennal joint small; front square; palpi linear, long and porrect; bristles strong, a presutural and a dorsocentral present in front of the suture; costa not bristly, stopping at the third vein. (North America.).....................*Aldrichiella* Hendel.

Arista slender; front usually transverse; palpi more or less clavate; mesonotum rarely bristly in front of the suture.....................11.

11. Posterior crossvein and anal cell entirely wanting, the anterior crossvein located much before the end of the first vein, the costa stopping at the third vein; cheeks narrow; palpi slender; tibiæ slender.......12.

Posterior crossvein present, the anterior crossvein opposite or beyond the end of the first vein; anal cell usually present.................13.

12. Face with a prominent central nasiform projection; antennæ rather long, arista bare; one presutural, mesopleural bristles present. (Africa.) *Risa* Becker.

Face deeply concave; antennæ short, the third antennal joint large, orbicular, the arista pubescent; no mesopleural bristles. (North America.) *Paramyia* Williston.

13. Tibiæ, especially the hind pair, compressed, explanate, and more or less clavate, particularly in the male; costa extends to the fourth vein..14.

Tibiæ not compressed and clavate in either sex; palpi large, porrect...17.

14. Head horizontally longer than high, the entire under side horizontally straight; front longer than wide; pteropleuræ with bristles; third and

fourth veins convergent, ending at wing-tip; base of costa not bristly; palpi elongate. (Africa.) .... *Leptometopa* Becker.

Head higher than long, the lower side not entirely horizontal; front not narrowed; first posterior cell not narrowed, ending beyond the wing-tip; palpi short and broad.................................... 15.

15. Antennæ broadly separated by the large carinate lunule; oral margin retracted; base of costa not bristly; pteropleural bristle present. (Asia.) *Hypaspistomyia* Hendel.

Antennal grooves confluent, the lunule not large; vibrissal angle prominent .... 16.

16. Base of costa furnished with bristly hairs; whole body opaque; cruciate bristles of front strong and usually on evident stripes; the two upper fronto-orbitals bent outward. (Europe, Asia, Africa, North America.) *Desmometopa* Loew.

Base of costa not bristly; body polished; cruciate bristles delicate, of the upper fronto-orbitals the anterior is proclinate, the other reclinate. (Europe, North America.) .... *Madiza* Fallen.

17. Under side of head long, straight, horizontal, the epistome projecting; front narrowed, with a longitudinal depression on each side; face carinate; abdomen pruinose; anterior dorsocentrals absent. (North America.) .... *Platophrymyia* Williston.

Under side of head rounded, not entirely horizontal; front quadrate; abdomen not pruinose; palpi greatly compressed................ 18.

18. Four strong dorsocentrals and one presutural present; third antennal joint very large, in the male quadrate; arista loosely pubescent; eyes hairy; three upper fronto-orbitals; scutellar bristles diverging; palpi bristly; dark pollinose species. (Europe, North America.) *Phyllomyza* Fallen.

Anterior dorsocentrals rarely present; eyes nearly or quite bare; palpi not markedly bristly; shining or subshining species.................. 19.

19. Anterior fronto-orbitals wanting, leaving only the upper three; apical scutellars converging; antennæ normal............................ 20.

About six pairs of fronto-orbitals descending quite to the antennæ, the lower set converging; proboscis slender, the part folding back as long as the middle portion; one or two dorsocentrals; no mesopleural bristle .... 21.

20. One dorsocentral and one pair prescutellars on the same transverse line, two supra-alars, one sternopleural; the upper fronto-orbitals on a line with the posterior ocelli, the second a little above the middle of the distance between the lower ocellus and the antennæ, the lowest immediately below the second and proclinate; cheeks narrow. (Europe, North America.) .... *Cacoxenus* Loew.

One anterior and three posterior dorsocentrals, three rows of acrostichals, no prescutellar, three weak supra-alar and one intra-alar; no sternopleural, one weak and one strong mesopleural; the three uniformly

spaced reclinate fronto-orbitals descend below the middle of the front; cheeks one third the eye-height; anal and second basal cells wanting, alula wanting (?), base of costa with bristly hairs; ovipositor large, broadly oval; labella fleshy and short. (Europe.)

Pseudopomyza Strobl.

21. Third antennal joint not large; three upper fronto-orbitals; bristles long, the apical scutellars diverging; middle and hind femora slightly enlarged; palpi greatly compressed, bare except for a few bristles on lower edge and at tip; base of costa with short fine hairs, the sections of the fourth vein 1:3; eyes round; testaceous species. (North America.) .... *Stomosis* n. g.

Third antennal joint very large, in the male quadrate and woolly-pubescent; two or three upper fronto-orbitals; scutellars converging; femora not incrassate; base of costa with short bristly hairs, the penultimate section of the fourth vein less than one third the length of the ultimate; eyes vertically lengthened; black species. (North America.)

Neophyllomyza n. g.

22. Wings rudimentary, scarcely longer than the scutellum; abdomen broadly swollen; one oral vibrissa; antennæ lying in a deep facial groove; mesonotum without discal macrochætæ. Parasitic on birds. (Europe.) (See: Collin, Nov. Zool., 18, 138 (1911).) .... *Carnus* Nitzsch.

Wings normal, longer than the abdomen; abdomen not swollen; not parasitic .... 23.

23. Second, third and fourth veins curving forward, ending before the tip of the wing; posterior crossvein beyond the middle of the wing; costa reaching the fourth vein; scutellum large, with lateral spinous tubercles near the apex, the apical scutellar bristles diverging; mesonotum punctulate, pleuræ smooth; cheeks very narrow. (Africa.)

Rhodesiella Adams.

Fourth vein ends beyond the wing-tip; scutellum normal, the apical bristles cruciate; mesonotum not punctulate; mesopleural bristles present; cheeks comparatively broad .... 24.

24. Costa continuing to the fourth vein; posterior crossvein much beyond the end of the first vein, the penultimate section of the fourth vein longer than the ultimate section of the fifth; costa not bristly; face strongly carinate; postverticals parallel; one pair of interfrontal cruciate bristles; anterior dorsocentral present. (North America.) . *Paramadiza* n. g.

Costa evanescent beyond the third vein; discal cell minute, the penultimate section of the fourth vein about one fourth the length of the ultimate section of the fifth vein .... 25.

25. Entire costa with well-separated bristles; second and third veins converging; center of the front with many rough hairs; face with a hemispherical subantennal depression; anterior dorsocentral present; tibiæ compressed. (Asia.) .... *Horaismoptera* Hendel.

Costa not spinose, but pectinate with stiff bristles up to the end of the

first vein; third vein ending at the wing-tip, not converging with the second vein; one pair of interfrontal cruciate bristles; face with two subantennal depressions and carinate medially between them; anterior dorsocentral wanting; postverticals parallel. (Europe, Africa, North America.) .... *Meoneura* Rondani.

PHOLEOMYIA Bilimek.

Three evident dorsocentrals; thorax nearly matte brownish black; abdomen of male not silvery .... 2.
One or two evident dorsocentrals; abdomen of male more or less silvery white .... 3.
2. Sides of front nearly parallel, the width of the front at the antennæ equal to the length of an antenna; abdomen concolorous with the thorax or slightly more shining. 4 mm. (W. Ind., N. H., Mass.,* Ct., Pa.,* N. J., Fla.,* Ga.,* Nebr., Id.*) (*Milichia.*) .... *indecora* Loew.
Front greatly narrowed toward the antennæ so that its least breadth is but little more than one-half the length of an antenna; abdomen with a dull red silky sheen. 4 mm. (Hayti.) .... *myopa* n. sp.
3. All the segments except the first of the male abdomen silvery .... 4.
At least two segments of the male abdomen not silvery .... 5.
4. Second segment of the male abdomen longer than the third and fourth together. 3 mm. (W. Ind., Ga.) (*Milichia.*) .... *leucogastra* Loew.
Abdominal segments of uniform size. (Ga.*) (Ann. Mus. Nat. Hung., V, 524, 1907: *Rhynchomilichia.*) .... *leucogastra* var. *dispar* Becker.
5. Second segment of the male abdomen with a median crescentic blackish spot on the silvery ground, the third and fourth segments wholly silvery. 3 mm. (Hendel: Wien. ent. Ztg., XXX, 40, figs. 5–7, 1911.) (S. Am., Mex.) .... *leucozona* Bilimek.
Second segment black, the third and fourth not wholly silvery .... 6.
6. Entire abdomen matte black, only the fifth segment with two silvery lateral spots. 2.5 mm. (Ga.) (Ann. Mus. Nat. Hung., V, 524, 1907.) (*Rhynchomilichia.*) .... *pseudodecora* Becker.
First and second segments entirely black, the front of the third, fourth and fifth segments with silvery fasciæ, that of the fifth segment interrupted. 2 mm. (Fla.) (*Milichia.*) .... *robertsoni* Coquillett.

Pholeomyia myopa new species.

Male.—Very close to *indecora* Loew, but differing in the structure of the head. The eyes are larger, encroaching on the front and face, the facets are larger, requiring about five to measure the width of the third antennal joint, whereas in *indecora* about six facets span the same distance. The front is conspicuously but uniformly narrowed toward the antennæ, where it is much narrower than the length of an antenna. The ocelli are close together and small, the ocellar triangle smaller than the third antennal joint. The cruciate

bristles are greatly reduced, but three distantly spaced pairs of insignificant hairs remaining. The lunule is highly arched, and notched at its summit. The face is correspondingly narrowed, and is provided with a median seam, which is lacking in *indecora*. The crowding of the face raises the oral bristles, which ascend fully half way to the antennæ. The palpi are bristly. In *indecora* the palpi are almost devoid of bristles and the oral vibrissæ do not extend half way to the antennæ. Furthermore, the abdomen of the present species is silky, with a distinct red sheen.

One specimen. Hayti.

MILICHIELLA Giglio-Tos.

Mesonotum gray pruinose, with five vittæ, of which the median one extends almost across the scutellum; abdomen brownish, somewhat shining; one dorsocentral; palpi white. 1.5 mm. (Porto Rico.) (*Ophthalmomyia.*) ....*cinerea* Coquillett.

Shining black species; thorax devoid of pollen; usually two dorsocentrals...2.

2. Palpi red, only the tip blackened; lunule, root of antennæ, knees and tarsi brownish; abdomen of male and female black. 3–4.5 mm. (Cal.*) (Wien. ent. Ztg., XXX, 39, 1911.)..................*nitida* Hendel.

Palpi, lunule, legs, etc., black.......................................3.

3. Upper side of abdomen of male entirely silvery. 2.5 mm. (N. Y., Ont.,* N. J., Fla., Ga.,* Kans.) (*Milichia: Lobioptera.*).....*arcuata* Loew.

Abdomen of male and female mostly or wholly black..................4.

4. Second segment of male abdomen with a lateral silvery spot. 3.25 mm. (N. J.*)......................................*bisignata* n. sp.

Abdomen wholly without silvery markings..........................5.

5. Wings milky, veins white, first posterior cell almost closed in the margin. 2.5–3 mm. (Afr.; E. Ind.; W. Ind.;* Hawaii; S. Am.; N. J., D. C., Fla., Ga.,* Tex.,* N. Mex., Kans.) (*Ophthalmomyia.*) *lacteipennis* Loew.

Wings hyaline, first vein heavy and brown, a dark spot at the tip of the costal cell, first posterior cell narrowed but not nearly closed at its apex. 3 mm. (Cal.) (1 Rept. Laguna Marine Lab., 162, fig. 94, 1912.) ....*nigrella* Cole.

Milichiella bisignata new species.

Male.—Length 3.25 mm. Vertex a little wider than one third the head; third antennal joint with gray spongy pubescence, slightly reddish in ground color on the sides at the base; lunule black; about six vibrissæ; palpi black. Mesonotum glistening black; scutellum shining black; knob of halteres yellow. The four basal segments of the abdomen overlaid with brown dust except as follows: the extreme sides of the first segment, the broad sides of the second, the apical angles of the third and fourth. The extreme base of the fifth seg-

ment is similarly dusted, the remainder polished black. The apical angles of the second segment filled with a transverse silvery spot, the anterior margin of which is round. Legs black. Calypteres pure white. Wings hyaline, veins pale yellow, but a brown spot near the end of the first vein; third vein straight, the fourth vein curving forward so that the apex of the first posterior cell is one third as wide as the end of the submarginal cell.

I have two specimens before me, received from Professor Aldrich. These were collected by Mr. C. W. Johnson at Riverton, New Jersey, and bear date of July 4. The name *bisignata* is a manuscript name given by Mr. Coquillett to this species and has been used in the New Jersey Lists.

EUSIPHONA Coquillett.

Dull black, including the antennæ, palpi, halteres and legs, the tarsi infuscated; the face and genæ white-pruinose, and when viewed from in front the whole front between the narrow orbits is golden pruinose, leaving the elongate narrow ocellar triangle black; wings very faintly smoky. 5 mm. (Vt.,* N. J., Ill.,* Col.) .... *mira* Coquillett.

ARCTOBIELLA Coquillett.

Black, including the halteres, the body opaque, somewhat velvety; wings pale brownish, the anterior crossvein near the middle of the discal cell. 4 mm. (B. C.) .... *obscura* Coquillett.

ALDRICHIELLA Hendel.

Testaceous, the antennæ reddish with black arista, palpi yellow, proboscis black; a dark spot above the neck on the occiput and thorax, mesonotum reddish, scutellum, pleuræ and venter yellow, tergites black, but the sides of the abdomen becoming increasingly yellow towards the anus; metanotum and a spot at the base of the hind coxæ black; halteres yellow, wings hyaline. 2.5 mm. (S. Dak.*) (Wien. ent. Ztg., XXX, 37, 1911.) .... *agromyzina* Hendel.

PARAMYIA Williston.

Shining black, the front with a dull stripe on each side of the elongate ocellar triangle; halteres, knees, front tibiæ and the tarsi brown; postverticals long, cruciate, one sternopleural; palpi long, straight and porrect; both the upper divergent and the lower convergent fronto-orbital bristles present. 2 mm. (Pa., Ga.,* W. Ind.) (*Nigra* Williston.) (*Phyllomyza.*) .... *nitens* Loew.

DESMOMETOPA Loew.

The interfrontal cross-bristles located on evident stripes which form a letter M on the black front..2.

The cross-bristles are not located on specialized stripes; front red anteriorly; cheeks, palpi and halteres yellow· front tibiæ with two narrow pale rings, tarsi annulate; hind femora of male strongly explanate. (Eur.; Ont.; Mass.,* Pa.,* N. J., Ill.,* Tex.,* S. Dak., Ala., Wash.*)
latipes Meigen.

2. Halteres black; palpi and legs wholly black; entire insect black. (Eur.;* Id., Wash.,* B. C.*)............................*sordidum* Fallen.

Halteres pale ....3.

3. Palpi wholly black; tarsi more or less reddish; cheeks black, narrow, the pollinose lower edge delimited from the polished upper part by a waving line. (Africa; Asia; Cuba; Ga.,* Mass.,* Tex.*). *tarsalis* Loew.

Palpi yellow at the base and black at the end; tarsi black; cheeks one third the eye-height, the pollinose lower portion with biangulate margin. (Eur.; Afr.; Mass.,* N. J.) ....*m-nigrum* Zetterstedt.

MADIZA Fallen.

Polished black, including the halteres, the abdomen very lightly dusted; lunule, palpi and posterior tarsi yellowish; wings whitish hyaline, veins pale yellow. 2 mm. (W. Ind.; Mass.,* N. Y.,* N. J., Ill.,* Fla., Tex.,* Col.,* Wyom.,* N. Mex., Id., Wash.,* B. C.*) (*Desmometopa*.)
halteralis Coquillett.

PLATOPHRYMYIA Williston.

I strongly suspect that this genus and *Leptometopa* Becker are the same. The narrowed first posterior cell, the pruinose abdomen, the whitish wings, the narrowed front, and the long horizontal oral margin are suggestive of the synonymy. The strikingly explanate hind tibiæ of *Leptometopa* are characteristic of the males alone. It is possible either that the West Indian species is not so formed, in which case the two are different genera, or that the description of *Platophrymyia* was drawn up from a female. Williston states that the legs are short and rather strong, a description that characterizes the female of *Leptometopa*. I have specimens of *Leptometopa* from Cape Colony, South Africa.

Black, including the antennæ and palpi; thorax lightly cinereous, abdomen pruinose; halteres yellow; metatarsi yellowish; wings whitish-hyaline. 2 mm. (W. Ind.)...............................*nigra* Williston.

PHYLLOMYZA Fallen.

Dull black, the halteres, tarsi and more or less of the tibiæ brown; wings cinereous hyaline; interfrontal setulæ continuing to the lunule; third antennal joint of female orbicular, of male very large, quadrate and sericeous-pubescent; face of male greatly excised in profile. 2.5 mm. (Eur.;* N. J.) .... *securicornis* Fallen.

CACOXENUS Loew.

Head and thorax blackish, but overlaid with opaque yellow pollen; legs, abdomen and scutellum yellow, the base of the scutellum merging with the color of the mesonotum; wings hyaline, with yellow veins. 2 mm. (Cuba.) .... *semiluteus* Loew.

STOMOSIS new genus.

Postverticals long, cruciate; ocellars distant from each other the width of the front ocellus; interfrontal hairs very few, a pair of converging hairs at the middle of the front; three upper diverging fronto-orbitals; buccal ridge with a row of small bristles diminishing in size toward the occiput; lowermost occiput with three oral bristles. Proboscis long, slender, rigid, geniculate at the middle; palpi elongate, spatulate, strongly compressed, bristly along edge at tip. Third joint of antennæ rounded, orbicular, incumbent on the face; arista one and one half times the length of the antennæ, short-pubescent with fine and rather close hairs. Eyes rounded, the cheeks one sixth the eye-height; vibrissal angle moderately prominent; face much excised in profile; genæ greatly attenuated along the middle of the face. One humeral, two notopleural, one presutural, one supra-alar, two intra-alar, two approximate dorsocentrals, six rows of acrostichals; the apical scutellars very long and diverging; one posterior sternopleural. Legs rather stout, front femora with bristles, no preapical tibial bristles. Costa continuing to the fourth vein; before the first vein the costa has short, fine hairs; second, third and fourth veins parallel; sections of fourth vein proportioned about one to three, the penultimate section slightly longer than the ultimate section of the fifth vein.

Type: *Stomosis* (*Desmometopa*) *luteola* Coquillett.

Testaceous, including the antennæ, halteres and legs, the abdomen a little brownish; a brownish line extends along the upper edge of the sternopleura; arista and bristles black; wings hyaline, veins yellowish. 2 mm. (Ariz., Tex.*) .... *luteola* Coquillett.

NEOPHYLLOMYZA new genus.

Postverticals converging; paired cruciate bristles present along the middle of the front; fronto-orbital bristles extending quite to the antennæ, the upper ones diverging, the lower converging. Face excavated, cheeks narrow, the vibrissal angle prominent, oral vibrissæ large; eyes vertically lengthened. Antennæ large, of the male greatly enlarged, the arista slender, short-pubescent, the hairs dense or loose. Proboscis long, slender, geniculate; palpi enlarged, compressed, porrect, bristly along the edge at the end.

One large dorsocentral, one humeral, two notopleural, one presutural, two supra-alar, acrostichal and other setulæ numerous and uniformly distributed; apical scutellar bristles long and converging; one sternopleural, no mesopleural bristles. Legs rather strong, setulose; pulvilli minute; no preapical tibial bristles. Costa attains the fourth vein, twice broken, towards the base ciliate with fine, small bristles and with a stronger humeral bristle before the first break; second, third and fourth veins parallel; crossveins approximate; fifth vein evanescent; second basal and anal cells rudimentary or incomplete.

Type: *Neophyllomyza quadricornis*, new species following.

TABLE OF SPECIES OF *Neophyllomyza*.

Submarginal cell narrowed at its extremity, its costal margin about one half that of the first posterior cell; penultimate section of the fourth vein less than one third as long as the ultimate section; knees, more or less of the tibiæ and all of the tarsi yellow; frontal orbits subshining; mesonotum shining; proboscis shorter than the head. 1.5 mm. (West Ind.) .... *magnipalpus* Williston.

Submarginal cell as broad as the first posterior cell at the extremity; at least the tibiæ black; proboscis longer than the head.................. 2.

2. Mesonotum polished black; orbits narrowly shining; penultimate section of the fourth vein one third as long as the ultimate section; anal cell rudimentary; tarsi yellow; halteres shining black. 2.25 mm. (Id.*) *nitens* n. sp.

Mesonotum sericeous black; front entirely sericeous; penultimate section of the fourth vein less than one fourth as long as the ultimate section; anal cell wanting; tarsi black or blackish; halteres blackish. 1.5 mm. (Id.,* Wash.,* N. Mex.,* La.*).................. *quadricornis* n. sp.

Neophyllomyza quadricornis new species.

Male.—Length 1.5 mm. Black, subshining. Front sericeous, the orbits, ocellar triangle and the stripes for the cruciate bristles not differentiated; two

diverging upper and two converging lower fronto-orbitals; three pairs of cruciate bristles and an additional one above the base of each antenna; front broader than long, the frontal suture arched over each antenna. Face extraordinarily excavated to receive the large antennæ, the facial orbits obliterated; cheeks one tenth the eye-height. The third joint of the antennæ greatly enlarged, subquadrate, reaching quite to the oral margin, densely clothed with erect silky pubescence, the arista as long as the diagonal of this joint. Proboscis long, slender, the elbow extending much beyond the epistome; palpi porrect, compressed, subulate. Mesonotum subshining, almost sericeous; one large dorsocentral, setulæ numerous; pleuræ polished; abdomen subshining. Legs entirely black, at most the tarsi brownish. Halteres dull black; calypteres dusky, with a loose fringe. Wings hyaline, the veins black; the vein between the first and second basal cells wanting, anal cell entirely wanting; penultimate section of the fourth vein about one fifth as long as the ultimate section and about one half the length of the ultimate section of the fifth vein.

Female.—The female differs in the structure of the head. The third joint of the antennæ is much reduced in size, scarcely reaching the mouth and it is less quadrate, but is similarly pubescent; the arista is nearly two times the length of this joint. The face is less remarkably excavated.

Five males and two females from the Cedar Mountains of Idaho; Bellingham, Washington; Cloudcroft, New Mexico; and Opelousas, Louisiana.

Neophyllomyza nitens new species.

Female.—Length 2.25 mm. Polished jet black, the tarsi alone yellow; last antennal joint and palpi dull black, the front sericeous except the polished narrow orbits, ocellar triangle and the slender stripes bearing the cruciate bristles; the basal three segments of the abdomen lightly dusted. Front nearly square, the uppermost frontal bristle inclinate, the next two divergent, the lowermost two convergent, between the lowermost two is a pair of minute convergent bristles; five pairs of cruciate setulæ; postverticals large. Arista microscopically pubescent, about six times as long as the third antennal joint. Palpi very broad; elbow of proboscis not reaching beyond the epistome. One dorsocentral; mesopleuræ closely fine-hairy and not setulose; one sternopleural. Calypteres minute but with numerous cilia. Halteres black, the knob polished. Wings hyaline; penultimate segment of the fourth vein about one third as long as the ultimate segment and equal to the ultimate segment of the fifth, which is evanescent at the end; second basal and anal cells minute, barely formed.

One specimen, Avon, Idaho, July 26, 1912.

PARAMADIZA new genus.

Front below the ocelli quadrate, one third broader than long; ocellar triangle large, reaching nearly to the frontal suture, before its apex a single pair of cruciate bristles; four fronto-orbital bristles, the lower two convergent, the upper two divergent; postverticals approximate and parallel, strong; frontal suture transversely bisinuate. Face nearly vertical, with two large deep subantennal depressions and strongly carinate medially, the epistome slightly projecting. Cheeks one fourth the eye-height, the vibrissal angle rounded-rectangular; occiput obliquely descending to the vibrissal angle, its ridge with a row of strong bristles; two strong and one weak vibrissæ along the front of the small bucca; eyes rounded, longest vertically. Antennæ small, reaching two thirds the distance to the oral margin, the arista about twice the length of the orbicular third joint, bare. Proboscis short, fleshy; the palpi clavate. Two humeral bristles; two notopleural, one presutural, two supra-alars, one intra-alar, three dorsocentrals in back and one in front of the suture, acrostichals sparse, four scutellars; one sternopleural, one lower and one postero-superior mesopleural in addition to the setulæ, no prothoracic bristles. Scutellum subtriangular, flat, bare. Abdomen with five segments plus the ovipositor, with sparse setulæ. Legs moderately stout, front femora bristly, posterior tibiæ with small apical spurs, but not at all compressed; pulvilli small. Calypteres rudimentary, bare. Costa continuing to the fourth vein, broken beyond the humeral crossvein and before the end of the first vein, at the latter place with two stout bristles and at the humeral break with one similar bristle, base of the costa with two long and strong bristles, costa otherwise not bristly; third vein diverging from the second so as to end at the wing tip; discal cell long, posterior crossvein beyond the middle of the wing and anterior crossvein much beyond the second costal break, the penultimate section of the fourth vein nearly one half as long as the ultimate section and longer than the ultimate section of the fifth vein; basal cells small but evident, the anal vein reaching half way to the margin.

Type species: *Paramadiza washingtona,* new species following.

Paramadiza washingtona new species.

Female.—Length 2.75 mm. Shining black, thorax with sparse hair and fine but long dorsocentrals. Antennæ, palpi and proboscis black; front shining. Tarsi brown. Halteres and calypteres yellow. Wings hyaline, with slight whitish tinge, veins yellowish, their roots paler.

One specimen, Wawawai, Washington.

While this species superficially resembles *Madiza halteralis*, it is very different.

MEONEURA Rondani.

Shining black; the ocellar triangle large, polished, black, the remainder of the front sericeous and often red; a single pair of cruciate bristles, located near the antennæ; postverticals close together and parallel; cheeks sometimes reddish in front; mesonotum very lightly dusted; knob of halteres white; fourth vein very weak, the two crossveins very close together. 1 mm. (Eur.; Alaska,* Id.,* Wash.*) (*Agromyza lacteipennis* Fallen.) .... *vagans* Fallen.

SUBFAMILY AGROMYZINÆ.

TABLE OF THE GENERA.

Arista completely wanting, the third antennal joint large; front shining and closely hairy, no fronto-orbital bristles or oral vibrissæ; eyes large, microscopically pubescent, the cheeks linear; mesonotum close-hairy, bristleless; no sternopleurals, mesopleuræ setulose; scutellum large, triangular, with sharp edge and with two minute apical bristles; legs without spurs or bristles; calypter rudimentary, not ciliate; wings short and broad, the costa extending to the third vein, the second basal fused with the discal cell; auxiliary vein parallel with the first vein, the costa twice broken. (Europe, Africa, Australia, North America.) .... *Cryptochætum* Rondani.

Arista present; front rarely shining, rarely pubescent, and always with fronto-orbital bristles present; vibrissæ present; eyes rarely hairy, smaller, the cheeks broader; mesonotum, scutellum and pleuræ provided with macrochætæ; scutellum with rounded edge; tibiæ with apical spurs; calypteres ciliate; wings with the second basal usually distinct from the discal cell, but sometimes fused with the first basal; the costa broken only at the end of the auxiliary vein .... 2.

2. Ocellar triangle placed forward on the front, the front usually produced, more or less cone-like, and pubescent; arista pubescent to short-plumose; tibiæ with preapical bristle; mesopleuræ bare; wings pictured, irrorate or fasciate. (North and South America.) *Traginops* Coquillett.

Ocelli placed on the vertex, the front not produced; arista short-pubescent or bare; wings at most with small dark spots....................3.

3. Third antennal joint ovate but with a sharpened end, the arista somewhat thickened; two scutellar bristles. (Europe, Asia, North America.) *Cerodonta* Rondani.

Third antennal joint not ending in a blunt point; four scutellar bristles present ....4.

4. Cheeks but one sixth the eye-height; two fronto-orbitals; face strongly convex; antennæ scarcely one sixth as long as the head; vibrissæ inserted distinctly above the front border of the oral margin. (North America.) ....*Hemeromyia* Coquillett.

Cheeks broader; three or more fronto-orbitals; face not convex........5.

5. Costa extending to the fourth vein, which is as strong as the third; cheeks receding; wings unspotted; femora not thickened; chætotaxy variable ....6.

Costa extending to third vein only..................................8.

6. Posterior crossvein wanting; second, third and fourth veins close together, ending before the tip of the wing, the fifth vein greatly diverging from the fourth. (North America.)................*Antineura* n. g.

Posterior crossvein present; the fourth vein ending beyond the tip of the wing, the fifth vein not greatly diverging.........................7.

7. Ovipositor wedge-shaped, short. (Europe, Asia, Australia, Africa, North America.) ....*Agromyza* Fallen.

Ovipositor tube-like, elongate. (Europe, North America.) .*Liriomyza* Mik.

8. Anterior crossvein situated near the base of the wing, the posterior crossvein wanting, or else very close to the anterior; fourth and fifth veins weak, the third vein ending far before the wing-tip; auxiliary vein usually parallel with the first vein..........................9.

Anterior crossvein situated nearly opposite the end of the first vein; posterior crossvein present, and always some distance from the anterior; third vein ending near the wing-tip, the fourth and fifth veins not weaker than the second and third.............................10.

9. Posterior crossvein entirely wanting. (Europe, Asia, Africa, North America.) *Phytomyza* Fallen.

Posterior crossvein present, the discal cell minute. (Europe, North America.) *Napomyza* Haliday.

10. Hind femora more or less incrassate; vibrissal angle of cheeks prominent; lower occiput reaching forward and bristly; wings usually spotted, at least at the end of the first vein..................................11.

Hind femora not thickened; cheeks receding, the occiput descending straight down; wings not spotted. (Europe, Africa, North America.) *Domomyza* Rondani.

11. Mesopleuræ not hairy; postverticals strong; four or five dorsocentrals; two intra-alars; no preapical tibial spurs; femora yellow with preapical spot. (Europe, North America.)............*Odinia* Desvoidy.

Mesopleuræ hairy and with two bristles; no postverticals; four dorsocentrals; one intra-alar; preapical bristle of tibiæ present; femora black. (Europe.) .... *Neoalticomerus* Hendel.

CRYPTOCHÆTUM Rondani.

The genus *Cryptochætum* is anomalous in any group. The following species were originally described as *Lestophonus,* as a genus of the Oscinidæ. The humeral break of the costa, as well as other characters, suggests the Milichiinæ, but the postverticals are divergent, as in the Agromyzinæ alone. The postverticals are inconspicuous among the erect, short, stiff hairs of the vertex, but can be differentiated as a pair of divergent hairs immediately behind the ocellar triangle.

Penultimate section of the fourth vein one half the length of the ultimate section; fourth and fifth veins not weakened; face, front, mesonotum and scutellum deep blue, rather shining; abdomen shining blue-green; antennæ black, legs blackish; wings grayish hyaline, veins dark brown. 1.5 mm. (Australia, introduced into California.) .... *iceryæ* Williston.

Crossveins closer together; fourth and fifth veins slender beyond the crossvein; otherwise as in the preceding species. (Australia, doubtfully introduced into California.) .... *monophlebi* Skuse.

TRAGINOPS Coquillett.

Arista almost bare; lunule white, unspotted; sides of front cinereous, with setigerous black spots; thorax similarly spotted, pleuræ bivittate, abdomen brown, spotted; legs yellow, the base of the femora and two rings on the tibiæ brown; halteres yellow; wings hyaline, with numerous rounded brown spots. (Ga., N. J.) .... *irrorata* Coquillett.

ODINIA Desvoidy.

Bristles of front and mesonotum arising from brown dots, hairs of notum and abdomen arising from smaller brown dots; front and hind femora with subapical spot; tibiæ with median and apical black rings; wings reticulate with brown. 4.3 mm. (Ga.) .... *picta* Loew.

Body cinereous, not with setigerous spots; wings not reticulate............2.

2\. Wings immaculate; tibiæ brown; sternopleura and a spot above it brown; disk of mesonotum without acrostichal setulæ; abdomen dark brown. 1.5 mm. (N. H.) .... *immaculata* Coquillett.

Acrostichals present; crossveins at least clouded; tibiæ with one or two rings; pleuræ bivittate; abdomen with paired spots..............3.

3\. Front pubescent, reddish above antennæ; acrostichals not seriately arranged, but eight to ten on the suture; both crossveins dark brown; fifth vein reaches the wing-margin. 4 mm. (Eur.; Mich.) ... *maculata* Meigen.

Front nearly or quite bare, usually entirely gray; acrostichals in evident rows, on the suture six rows; crossveins but little clouded; fifth vein scarcely reaches the wing-margin. 2 mm. (Eur.; Mich.) *boletina* Zetterstedt.

CERODONTA Rondani.

Largely yellowish species, the disk of the mesonotum cinereous black, more or less marked with two paler vittæ and with a yellowish spot before the scutellum; pleuræ mostly yellow; scutellum yellow in the middle; legs yellow, the tarsi brownish. 2 mm. (Mass.,* N. H., D. C., N. J., W. Ind., La.,* Ind., Ill.,* Tex.*) (*Ceratomyza*.)......*dorsalis* Loew.

Mostly black; the mesonotum subshining black to the black scutellum, not vittate; pleuræ mostly black; legs black or blackish, the femora more or less yellow. 2.5 mm. (Eur.;* Mont.,* Wyom.,* Id.,* Wash.,* B. C.,* Ore.,* Cal.*)............................*femoralis* Meigen.

HEMEROMYIA Coquillett.

Black, the face and cheeks yellow, the antennæ, palpi and halteres brownish; ocellar triangle and the orbits slightly polished; four dorsocentrals; sections of the fifth vein proportioned one to five, the anterior crossvein at three fourths the length of the discal cell. 1.5 mm. (N. Mex.) *obscura* Coquillett.

ANTINEURA new genus.

Related to *Agromyza*, but the discal cell is open outwardly. Four fronto-orbitals, the lower three convergent; cheeks receding, about one third as deep as the eye-height; proboscis short and fleshy; arista bare, a little more than twice the length of the third antennal joint, its basal segment thickened. Mesonotum pollinose or shining; one anterior and three posterior dorsocentrals, two rows of sparse acrostichals; four scutellars; one sternopleural; two mesopleurals. Costa continuing to the fourth vein, broken only at the end of the first vein; the auxiliary vein rudimentary, confluent with the first vein along the middle of its course; second, third and fourth veins equally strong, parallel, located in the anterior part of the wing, the fourth vein ending before the wing tip; posterior crossvein entirely wanting, the anterior crossvein before the costal break; the vein between the first and second basal cells weak; only the base of the anal vein evident; the fifth vein gently curved, diverging from the fourth and ending at the middle of the hind margin of the wing, gradually evanescent, but its base as strong as the other longitudinal veins.

Type species: *Antineura togata,* following.

TABLE OF SPECIES OF *Antineura*.

Mesonotum, except the notopleural suture, pleuræ and abdomen entirely shining black; legs black except the knees. 1.2 mm. (Wash.*) *chlamydata* n. sp.

Mesonotum, pleuræ and abdomen more or less yellow, the mesonotum pollinose; legs largely yellow......................................2.

2. Largely yellow, the mesonotum, except the sides and hind margin black, center of sternopleuræ and bases of abdominal segments brownish. 1.5 mm. (N. Mex.) (*Phytomyza.*)..............*palliata* Coquillett.

Largely black, the sides and posterior angles of the mesonotum, the sides of the scutellum and the abdominal segments, except their outer margin, yellow; most of the pleuræ blackish. 1.2 mm. (Wash.)..*togata* n. sp.

Antineura chlamydata new species.

Male:—Length 1.2 mm. Black, the front and vertex, except the ocellar triangle, the face, cheeks, antennæ, notopleural suture and the halteres yellow. Clypeus black, the balance of the mouthparts yellowish. Cheeks about one fourth as deep as the eye-height, but broader behind. Mesonotum highly polished, jet black, the humeri and a rather broad extension above the notopleural suture towards the root of the wings yellow, the posterior angles black like the notum; middle of scutellum broadly yellow, pleuræ black. Abdomen entirely shining black, hairy. Legs black, the knees a little brownish. Halteres yellow. Wings hyaline.

One specimen, Oroville, Washington, May 1, 1912.

Antineura togata new species.

Length 1.2 mm. Head yellow, the occiput, ocellar triangle, clypeus and arista blackish, proboscis, palpi and antennæ yellow. Mesonotum opaque cinereous black, the sides and posterior angles yellow; middle of scutellum yellow; pleuræ blackish in ground color, but the sutures and an oblique line crossing the mesopleuræ broadly yellow. Abdomen subshining black, the hind margins of the segments bright yellow, the fifth segment largely yellow; in the female the very short sixth segment is yellow and the seventh segment is elongate, round-triangular, polished jet black and with four long marginal bristles. In the male apparently the sixth segment terminates the abdomen, and is rounded, microscopically pubescent and of the same piceous black color as the bases of the other segments. Legs of the female yellow except the dusky tarsi; of the male the tibiæ and tarsi are infuscated. Halteres pale yellow; wings hyaline.

One male, Pullman, Washington, May 12, 1912; and one female, Almota, Washington, June 24, 1911.

Agromyza Fallen.

TABLE OF THE SPECIES OF *Agromyza* Fallen, INCLUSIVE OF *Domomyza* Rondani AND *Liriomyza* Mik.

Halteres black; black or metallic species; ocellar triangle elongate and polished; frontal orbits polished; auxiliary vein ending in or close to the first vein..2.

Halteres whitish or yellow; ocellar triangle small and opaque; frontal orbits usually not differentiated; auxiliary vein usually ending independently in the costa..15.

2. **Calypter** and its hairs white; metallic species..........................3.

Calypter margined with black, its hairs dusky..........................6.

3. **Lower** part of face in profile receding; veins black; the fourth vein diverging from the third..4.

Lower part of the face projecting; veins subfuscous; fourth vein straight. (Pa.,* Mass.,* N. J.,* Ont., Ill.,* Ga., La.,* Tex.,* Wyom.,* Cal., Id.) *virens* Loew.

4. **Costa** evanescent beyond the tip of the third vein; wings broad; cheeks broad. (Wash.*)......................(*Domomyza*) *tamia* n. sp.

Costa reaching the fourth vein; wings normal; cheeks narrow. (*æneiventris* Fallen.) ....5.

5. **Last** two segments of the fourth vein proportioned 1 : 3; the fourth vein ends beyond the wing-tip; the segments of the fifth vein 3 : 2. (Eur.;* N. Y.,* N. J., W. Ind., Ga., N. Mex., Cal.,* Id.,* Wash.*) *æneiventris* Fallen, sens. str.

Segments of the fourth vein proportioned 1 : 4; the fourth vein less divergent from the third; segments of the fifth vein 1 : 1. (Eur.;* Cal.,* Wash.*) ....*æneiventris* var. *cunctans* Meigen.

6. **Metallic** species; segments of fourth vein 1 : 3; segments of the fifth vein 3 : 2; face not receding. (Eur.;* Id.,* Wash.*)..*pseudocunctans* Strobl.

Shining black species; segments of the fourth vein proportioned 1 : 4 to 1 : 8 ....7.

7. **Sixth** vein very evident and reaching nearly to the margin of the wing. (Eur., Afr., Asia; Mass.)........................*schineri* Giraud.

Sixth vein not very evident, and always abbreviated..................8.

8. **Male** with a conspicuous curved tapering bunch of oral vibrissæ; lower angle of the face of ♂♀ conspicuously produced; four frontal bristles; pubescence of frontal orbits sparse and inconspicuous; face subtuberculate between the antennæ. (Eur.;* Mass.,* Ill.,* La.,* Id.,* Wash.*) ....*curvipalpis* Zetterstedt.

Oral vibrissæ but one or two in number and not bunched; vibrissal angle not produced ....9.

9. **Middle** tibiæ with two bristles on the extensor side; no vibrissal angle to the face; front largely yellow; four fronto-orbitals; frontal orbits linear and nearly bare; arista five times as long as the third antennal

joint; seventh segment of ♀ abdomen depressed; auxiliary vein ending close to the end of the first vein, but independently in the costa; the sections of the fourth vein 1 : 4. 3 mm. (Hayti.*)...*diadema* n. sp.

Tibiæ without extensor bristles; face less receding; front black; the orbits broader; arista less than four times the length of the third joint; last segment of ♀ abdomen compressed; auxiliary vein ending in the first vein. (*maura* Meigen.) ....10.

10. Ocellar triangle longer than wide, its sides concave; the four lower frontal bristles close together, the fifth (uppermost) separated by a greater interval; sections of the fifth vein equal. (Proc. Ent. Soc. Wash., IX, 35 (1908).) (Mo., Que.,* Cal.).........*maura* var. *tiliæ* Couden.

Not with this combination of characters............................11.

11. Segments of the fifth vein 1 : 1; segments of fourth vein 1 : 10; tip of epistome sometimes visible in profile view; orbital pubescence very short, almost invisible; six frontal bristles; face carinate, its oral margin nearly straight. (Eur.; Ont., Ga.,* Pa., N. Y.,* N. J., Mass., Ill.*)..................................*maura* var. *simplex* Loew.

Basal sections of fifth vein longer than the apical section; crossveins less approximated; face receding or vertical, the lower angle rounded in profile; orbital pubescence usually dense and longer.............12.

12. Face short and strongly tuberculate between the antennæ, the epistome strongly emarginate; the lower two fronto-orbitals alone present; pubescence of frontal orbits very dense. (Eur.;* Id.,* Wash.*) *maura* var. *nasuta* n. var.

Face carinate, not shortened, the margin of the epistome less vaulted; the upper fronto-orbitals present; orbital pubescence less dense......13.

13. Seven fronto-orbital bristles; wings broadly rounded; segments of fourth vein 1 : 4. (Id.,* Wash.*)...........*maura* var. *setifrons* var. nov.

Four frontal bristles; segments of fourth vein 1 : 6 to 1 : 8...........14.

14. Third vein ending near the tip of the wing, nearer the second than the fourth vein; segments of fourth vein 1 : 6; sixth vein faint. (Eur.;* Id.,* Wash.*)............................*maura* Meigen, sens. str.

Third vein equidistant from the second and fourth; the fourth vein ending nearer the tip of the wing; crossveins more approximated, the segments of the fourth vein 1 : 8; sixth vein usually wanting. (Eur.;* Wash.*) ....*maura* var. *morionella* Zetterstedt.

15. Thorax not bordered with yellow at the sides, at most a very narrow line present on the notopleural suture..............................16.

Thorax with distinct yellow lateral borders, extending more or less broadly along the notopleural suture..................................40.

16. Third antennal joint black..17.

Third antennal joint yellow or ferruginous..........................34.

17. Palpi black ....18.

Palpi yellow ....33.

18. Front, face and cheeks yellow, at most the upper orbits darkened......19.

Head wholly or mostly black; thorax at most lightly pruinose (if the frontal orbits are yellow compare *superciliosa*)..................22.

19. Notum and pleuræ pollinose, not shining; penultimate section of the fourth vein much shorter than the ultimate section of the fifth vein.....20.

Thorax shining, very lightly pollinose; legs entirely black; the penultimate section of the fourth vein nearly as long as the ultimate section of the fifth; four strong dorsocentrals; calypteres and fringe yellow; bristles of the head strong. 2 mm. (Mont.*).......*rutiliceps* n. sp.

20. Discal cell long and narrow, the anterior crossvein beyond the end of the first vein; knees sharply yellow; four strong dorsocentrals; five fronto-orbitals; fringe of calypteres blackish; wings slender, the veins strong. 2–3 mm. (Mont.,* Id.,* Wash.*)............*genualis* n. sp.

Discal cell shorter; the anterior crossvein before the end of the first vein; legs entirely black..21.

21. Dorsocentrals strong. 2 mm. (Ent. News, XXIII, 463 (1912).) (Ind.) *davisii* Walton.

Dorsocentrals weak, hardly longer than the notal setulæ; last segment of ♀ abdomen longer than the second, third and fourth segments together, compressed, jet black. 2 mm. (Col.,* Id.*)..........*auriceps* n. sp.

22. Black, the abdomen especially greenish; two dorsocentrals; the segments of the fifth vein 3:2; anterior crossvein at one third the length of the discal cell. (D. C., Mass., Ga., W. Ind., Wisc., S. Dak.) *viridula* Coquillett.

No trace of metallic coloring; anterior crossvein near or beyond the middle of the discal cell ....23.

23. Large bristly species, usually with five strong frontal bristles and with one or two dorsocentrals before the suture; front very broad and uniformly opaque; calypteres dark, with bushy black fringe; antennæ brown at base; basal cells separate. (D. C., Mass.,* N. Y., Fla., W. Ind., La., Col., N. Mex., Cal.)....................*setosa* Loew.

Less bristly species, not more than four dorsocentrals; antennæ black; calypteres white ....24.

24. Costa interrupted at the third vein or much thinned between the third and fourth veins; mesonotum lightly pruinose and subshining; usually a small dorsocentral in front of the suture......................25.

Costa continuing to the fourth vein; as far as known, the calypteres entirely white and fringed with white hairs; rarely with four dorsocentrals ....27.

25. Calypteres fringed with white hairs; costa entirely interrupted at the third vein. (*nigripes* Meigen.) 26

Calypteres fringed with white hairs; costa faint beyond the third vein; discal cell moderately large; sections of the fourth vein 1:3, of the fifth vein 3:2; front tibiæ and all the tarsi sometimes brownish. (Eur.;* Id.,* Wash.,* Ore.*)......................*reptans* Fallen.

26. Sections of fourth vein 1:3, of the fifth vein 3:2. (Eur.;* S. Dak.,* Wash.*)................*nigripes* var. *cinerascens* Macquart, Strobl.

Sections of the fourth vein 1 : 4, of the fifth vein subequal. (Eur.;* Col.*) *nigripes* Meigen, sens. str. Schiner.

27. Second section of the costa about three times as long as the third section; fourth vein diverging from the third and ending much beyond the wing-tip; discal cell large, the segments of the fifth vein 3 : 2; wings broad; third antennal joint very small, the arista long, slender and pubescent ....28.

Second section of the costa about four times as long as the third section; arista short, stout at base, and apparently bare........................29.

28. Front broader, about one third the width of the head, brownish; abdomen black; frontal bristles fine. (D. C., N. J., Mass., Ont., Ill.,* Wisc.,* La.,* Kans., Tex.*)..............................*parvicornis* Loew.

Front narrower, less than one third the width of the head, the frontal lunule with a rounded white spot; abdomen black, in the ♂ the last few segments yellowish; frontal bristles robust. (Pa., Mass.,* N. H., Fla., Ill.,* La.,* S. Dak.*).....................*terminalis* Coquillett.

29. Discal cell large, the segments of the fifth vein 3 : 2; fourth vein ending far beyond the wing-tip, its segments about 2 : 5; four dorsocentrals; thorax lightly pollinose. (Eur.;* Id.,* Wash.,* Ore.*)..*reptans* Fallen.

First section of the fifth vein not greatly longer than the outer section; tip of the wing near the middle of the first posterior cell, the third and fourth veins subparallel...................................30.

30. Discal cell smaller than usual, the basal section of the fifth vein much shorter than the outer section; the sections of the fourth vein about 1 : 5; root of the wing and the notopleural suture narrowly whitish; at least the front knees yellow..................................31.

Basal section of the fifth vein longer than or subequal to the outer section; the sections of the fourth vein about 1 : 3......................32.

31. Scutellum broadly yellow in the middle; interfrontalia yellow. (Wash.*) *interfrontalis* n. sp.

Scutellum black; interfrontal sutures often striped with yellow above, but otherwise the front is black. (Eur.;* Mass.,* Id.,* Wash.*) *luctuosa* Meigen.

32. A narrow yellow sutural line along the sides of the thorax, expanding beneath the root of the wing; knees, front tibiæ and the tarsi more or less yellowish; frontal lunule white-pollinose; wings broader. (Pa., N. J., Mass.,* Wisc., Ill.,* La., Wash.*)..............*angulata* Loew.

Thorax not marked with a lateral yellow line; legs generally darker; front opaque black; wings narrower. (Nebr., Mass.,* D. C., Va., Fla., W. Ind., La., Tex., Ill.,* Wisc.,* S. Dak., Wash.,* Alaska.)..*neptis* Loew.

33. Front broader than long, black, but yellow below; antennæ entirely black; penultimate section of the fourth vein about one third as long as the ultimate section of the fifth vein. (W. Ind.)......*anthrax* Williston.

Front mostly yellow; base of the antennæ yellowish; penultimate section of the fourth vein two thirds as long as the ultimate section of the fifth

vein; wings rather narrow. (D. C., Mass., La.,* Wisc.,* Ill.,* Kans., S. Dak., Tex.,* Col., Wyom.) .... *longipennis* Loew.

34. Four dorsocentrals; face and cheeks largely or wholly yellow; palpi yellow .... 35.

Two or three dorsocentrals; mesonotum subshining.................. 38.

35. Basal section of the fifth vein much shorter than the apical section, the anterior crossvein before the end of the first vein; knees not yellow; thorax opaque pollinose; three fronto-orbitals; cheeks one third the eye-height; antennæ infuscated above. (Eur.;* Id.,* Wash.*) *perpusilla* Meigen.

Sections of the fifth vein subequal; knees conspicuously yellow........ 36.

36. Third and fourth veins strongly diverging at the tip, veins brown; mesonotum rather densely whitish-gray pruinose; lower half of the frontal vitta yellow. 2.5 mm. (Col.) .... *pruinosa* Coquillett.

Third and fourth veins parallel, their tips but little diverging; front mostly yellow .... 37.

37. Front yellow, a central spot sometimes blackened; mesonotum subshining; veins rather weak; three fronto-orbitals; cheeks one sixth the eye-height; antennæ more or less infuscated, the arista black. (D. C., Mass., La.,* Ill.,* Wisc.,* Kans., S. Dak., Tex., Col., Wyom.) *longipennis* Loew.

Front yellow; mesonotum opaque pollinose; veins brown; four to six fronto-orbitals; cheeks one third the eye-height; antennæ pale yellow, the arista yellow at the base. (Alaska.) .... *pollinosa* n. sp.

38. Front narrow, uniformly brownish or black; face and cheeks black; third antennal joint minute; hairs of the mesonotum arranged in rows; wings broad, the segments of the fifth vein 3 : 2. (D. C., N. J., Mass.,* Ont., La.,* Kans., S. Dak.,* Tex.*) .... *parvicornis* Loew.

Front black above, yellow below; face and cheeks yellow.............. 39.

39. Tarsi black, sometimes the metatarsi yellowish; acrostichal hairs in rows; hairs of calypteres dusky; four fronto-orbitals; basal section of the fifth vein longer than the apical section. (Eur.; Id.,* Wash.*) *sulphuriceps* Strobl.

Metatarsi yellow; hairs of mesonotum irregularly placed; sections of the fifth vein subequal. (D. C.) .... *varifrons* Coquillett.

40. Front above lunule mostly or entirely black; face black; fringe of calypteres white; legs black; antennæ black. (In *superciliosa* the calypteres have a dark fringe.) .... 41.

Front largely or wholly yellow; usually the face and always the cheeks yellow .... 48.

41. Side stripes of the thorax broadly yellow; scutellum, upper pleuræ, rear of mesonotum, and base of abdomen, yellow....................... 42.

Yellow stripes of thorax narrower; almost entirely black species....... 43.

42. Mesonotum opaque; sections of the fifth vein equal; frontal lunule yellow; costa ending at third vein. (S. Am., W. Ind.) *xanthophora* Schiner, Williston.

Mesonotum polished; last section of the fifth vein shorter than the preceding section; front black; four dorsocentrals. (Mex.)
picta Coquillett.

43. Sides of front yellow along the orbits; knees broadly yellow; hairs of calypteres black; fourth vein ending at wing-tip, wings broad. (Eur.;* Wash.,* Ore.*) . . . . *superciliosa* Zetterstedt.
Frontal orbits black; knees narrowly yellow; hairs of calypteres pale; fourth vein ending usually beyond the wing-tip (compare also *luctuosa* in couplet 31) . . . . 44.

44. Apical segments of ♂ abdomen yellow; wings broad, the third and fourth veins somewhat divergent, the fourth vein ending much beyond the wing-tip; frontal lunule marked with a small white dot; arista long and pubescent. (N. H., Pa., Fla., La.,* Ill.,* S. Dak.*)
terminalis Coquillett.
Abdomen black, the incisures more or less yellow; the third and fourth veins subparallel, the fourth vein ending at or slightly beyond the wing-tip . . . . 45.

45. Arista more than two times the length of the antenna, plainly pubescent, the antennæ short; wings broad; frontal lunule white-pollinose. (Mass.,* N. J., Pa., La., Ill.,* Wisc., Wash.*) . . . . *angulata* Loew.
Arista shorter, bare; wings narrow . . . . 46.

46. Antennæ large, porrect, the arista thick; sections of the fifth vein subequal; scutellum black . . . . 47.
Antennæ small, the arista slender; discal cell small, the sections of the fifth vein 1 : 2; scutellum yellow. (Wash.*) . . . . . *interfrontalis* n. sp.

47. Antennæ strikingly large; thorax pollinose; four dorsocentrals; frontal lunule often yellow. (*magnicornis* Loew.) (Eur.;* Mass., N. J., Pa., Ga., Ill.,* Wisc.,* S. Dak., Col., Wash.*) . . *grossicornis* Zetterstedt.
Antennæ not abnormal; thorax subshining; four or three dorsocentrals; frontal lunule black. (Proc. Ent. Soc. Wash., VI, 191, 1904.) (Cal.,* Ore.,* Wash.,* Alaska.*) . . . . *tæniola* Coquillett.

48. Antennæ black, at least the third joint black . . . . 49.
Antennæ entirely yellow, sometimes the end of the antenna may become infuscated above . . . . 54.

49. Front entirely yellow, or centrally yellow; fringe and margin of the calypteres dusky . . . . 50.
Center of front above lunule velvet black, bordered with yellow on the sides; wings narrow, the penultimate section of the fourth vein one third as long as the ultimate section and longer than the posterior crossvein, the sections of the fifth vein subequal; calypteres and fringe white; pollinose species. (Mass., D. C., Ind.,* Ill.*) . . *marginata* Loew.

50. Plump shining black species, with black antennæ and legs; front narrower than long; two or three dorsocentrals. (*platyptera* Thomson.) . . . . 51.
Notum pruinose; front square; four dorsocentrals . . . . 53.

51. Frontal orbits black, at least above; subantennal grooves more or less

blackish. (Pa., Mass.,* N. Y.,* N. J., Ill.,* Wisc., La., N. Mex., Col., Id.,* Wash.*) .... *platyptera* var. *coronata* Loew.

Front entirely yellow, not bordered with black; face yellow............52.

52. Lateral yellow stripe of the thorax extending beneath the wings. (*malvæ* Burgess.) (Wisc., N. H., N. J., D. C., Fla., W. Ind.,* Ga., La.,* Ill.,* Mo., Tex.,* Col.)....................*platyptera* var. *jucunda* Wulp.

Lateral stripe extending above the root of the wings. (*lateralis* Williston, 1896, and not of Macquart, 1835, from Europe.) (W. Ind.) *platyptera* var. *allecta* nom. nov.

53. Base of antennæ, scutellum, a prescutellar spot, pleuræ, abdomen, and legs mostly yellow; anterior crossvein opposite or beyond the end of the first vein. (Wash.,* Alaska.*)......................*pacifica* n. sp.

Mostly black species, the whole of the antennæ, the mesonotum except the sides, the scutellum except the tip, the abdomen, and much of the pleuræ and legs black; anterior crossvein before the end of the first vein. (2 mm. (Id.*) ....*varia* sp. nov.

54. Scutellum entirely black; thorax opaque black, the abdomen black, except at sides and sometimes the incisures...........................55.

Scutellum yellow, at least in the middle............................57.

55. Legs, antennæ, cheeks, face and lower part of the front whitish; sections of the fourth vein about 1 : 10; mesopleuræ yellow. (Wash.*) *clara* n. sp.

Legs blackish, antennæ somewhat infuscated; face, front and cheeks yellow; sections of the fourth vein about 1 : 6; pleuræ largely cinereous. 56.

56. Knees not differentiated; three fronto-orbitals. (Eur.;* Id.,* Wash.*) *perpusilla* Meigen.

Knees yellow. (Greenland.)........................*arctica* Lundbeck.

57. Palpi large, projecting; scutellum with two bristles; thorax reddish, abdomen brown, its base yellowish; legs yellow, the hind femora tipped with black; penultimate section of the fourth vein longer than the last section of the fifth vein. (W. Ind.).......*innominata* Williston.

Palpi small; four scutellar bristles; four dorsocentrals; mesonotum more or less black; penultimate section of the fourth vein much shorter than the last section of the fifth vein..........................58.

58. Notum pruinose, pleuræ and abdomen but little shining; cheeks nearly as deep as the width of the eye. (If the cheeks are narrow compare *perpusilla* and *pacifica*.) (Id.*).......................*lima* n. sp.

Shining or subshining; cheeks relatively narrow....................59.

59. Usually broader and larger; mesonotum with a quadrate yellow spot in front of the scutellum; front usually square; sections of the fifth vein 2 : 3 ....60.

Smaller and more slender; mesonotum black to the scutellum; front narrower than deep; sections of the fifth vein more nearly 1 : 2. (*Scutellata* Fallen.)...63.

60. Ovipositor long, tubular, equalling three abdominal segments in length. (W. Ind.*)...........................(*Liriomyza*) *tubifer* n. sp.

Ovipositor short, wedge-shaped, about as long as the other abdominal segments. (*melampyga* Loew.) ....61.

61. Tibiæ and tarsi wholly black, the femora yellow varied with black; abdominal segments fasciate with black and yellow. (N. Y., N. Mex.)
melampyga var. *flavonigra* Coquillett.

Femora, tibiæ and tarsi largely yellow; abdomen not conspicuously fasciate ....62.

62. Genitalia shining black, contrasting with the abdomen. (*flaviventris* Johnson, 1902, and not of Strobl, 1898, which is *grossicornis* Zetterstedt.) (D. C., Mass.,* N. H., N. Y., N. J., La., Wisc.,* Col., Wyom., N. Mex.*) ....*melampyga* Loew, sens. str.

Genitalia concolorous with the yellow-brown abdomen. (W. Ind., Bolivia,* Tex.,* Ill.*) ....*melampyga* var. *sorosis* Williston.

63. Abdomen black above, the sides not yellowish, but the incisures somewhat yellow ....64.

Sides of the abdomen somewhat yellow ....66.

64. Discal cell very small, coextensive with the auxiliary cell, the second and third sections of the fourth vein about 1 : 10; legs with at least the femora yellow; antennæ yellow, sometimes dusky at the tip. (Eur.;* Mass.,* Ill.,* La.,* Tex.,* Id.,* Wash.*)...*scutellata* Fallens, sens. str.

Discal cell surpassing the auxiliary cell, the sections of the fourth vein about 1 : 8; legs darker ....65.

65. Legs, including the femora, somewhat infuscated. (*brassicæ* Riley.) (Eur.;* U. S.) ....*scutellata* var. *pascuum* Meigen.

Legs black except the knees; third antennal joint somewhat darkened at the tip. (Eur.;* Afr.; Id.,* Wash.*)..*scutellata* var. *orbona* Meigen.

66. Legs mostly yellow; usually larger species. (Eur.;* Wash.,* Cal.*)
scutellata var. *variegata* Meigen.

Legs black except the knees; third antennal joint darkened at the tip. (*pictella* Thomson.) (Eur.;* Id.,* Wash.,* Ore.,* Cal.)
scutellata var. *puella* Meigen.

Domomyza tamia new species.

♂♀. Length 2.75 mm. Blue-black species with black halteres; face receding in profile; wings broad, veins black, the costa evanescent beyond the third vein; calypteres white and fringed with white hairs. Black, with metallic blue and green reflections. Head dull black, not metallic; front as broad as high, opaque blackish, no lateral shining stripes, the usual shining portion around the ocelli blunt in front, not triangular, seven fronto-orbital bristles, the orbital pubescence, *i. e.*, that between the bristles and the eyes, comparatively long and dense; mouth-opening greatly arched, so that the end of the clypeus is directly under the antennæ, the face thereby appearing to recede in profile, the face rather sharply carinate by the descending lunule, the antennal grooves deep; cheeks two thirds as deep as the eye-height, the hairs along the oral margins not conspicuous. Antennæ small and black, the outer joint not

longer than the inner, the arista one and one half times as long as the antenna. Proboscis short, black, its labella sometimes dusky; palpi small, narrow, straight and with a single terminal hair. Thorax, scutellum and abdomen metallic green or blue, three pairs of long dorsocentrals, the pubescence normally fine; abdomen highly polished, last segment of female long, triangular, jet black. Halteres black, calypteres entirely whitish and with white hairs. Legs black, subshining. Wings broad, hyaline, veins black, the costa thickened and vaulted in front of the marginal cell, and vanishing beyond the end of the third vein; third vein ending slightly in front of the tip of the wing, the fourth vein somewhat diverging from the third and ending beyond the wing apex; discal cell relatively broad, the anterior crossvein slightly beyond its middle; outer segments of fourth vein proportioned one to four, segments of fifth vein four to three.

One male and five females, Wawawai, Washington, May 20, 1911.

This species might well be assigned to Rondani's genus *Domomyza*, the other species of which are evidently related to the second group of *Agromyza*, with pale halteres. The present species shows such close relationship to the *æneiventris* group that it should not be separated from these species merely because of an abbreviation of the costa. The species *Agromyza reptans* Fallen and *nigripes* Meigen frequently exhibit a thinning away of the costa beyond the third vein and such individuals could very well be classified as *Domomyza*.

Agromyza diadema new species.

Female.—Length 3 mm. Polished black, the front and lunule yellow, notopleural and meso-pteropleural sutures very narrowly yellowish. The yellow of the front becoming brown on the upper part, but clearly differentiated from the black orbits and the small ocellar triangle; sides of ocellar triangle convex. Four reclinate fronto-orbitals, uniformly spaced, the space between them and the eye unusually narrow and nearly devoid of hairs. Face strongly receding, no vibrissal angle, cheeks one fifth the eye-height, a single oral vibrissa; in profile the front edge of the clypeus is visible; center of face flattened, scarcely carinate nor grooved, the edge of the epistome shallowly arched. Antennæ nearly reaching the margin of the epistome, the almost bare arista five times the length of the third joint. Palpi and proboscis black, the former broad, but not reaching beyond the oral opening.

Two dorsocentrals, about eight rows of acrostichals, one presutural, two notopleural, two sternopleurals, one strong mesopleural. Last abdominal segment jet black, flattened, a little longer than the preceding segment, the projecting ovipositor slender, enlarged apically, its upper and lateral edges serrate. Middle tibiæ with a bristle on the postero-extensor edge below the middle and a smaller one just above. Calypteres whitish, the margin and fringe black. Halteres black, their roots paler. Wings hyaline, veins strong; costa thick-

ened at the junction of the first vein; auxiliary vein separate from the first vein, but closely approaching it near the tip; basal section of front edge of the discal cell twice as long as the other section, the latter nearly equalling the posterior crossvein, and about one fourth the length of the ultimate section of the fourth vein; sections of the fifth vein three to two; anal vein faint; the third section of the costa nearly equal to the fourth and about one fifth the length of the second section.

One specimen, Hayti.

While the auxiliary vein ends independently in the costa, it approaches very closely to the first vein near its end. Its course is thus quite different from that found in the lighter colored species of *Agromyza*.

Agromyza maura var. setifrons new var.

Male.—Seven fronto-orbital bristles, orbital pubescence long; crossveins not approximate, the outer segments of the fourth vein proportioned about one to four, discal segment of the fifth vein a little longer than the last segment; third vein uniformly curved backward so that it diverges from the second and ends almost at the wing tip, fourth vein ending considerably beyond the tip of the wing; wings broadly rounded; four sternopleural bristles in the upper series; abdomen black.

One male, from Troy, Idaho, June 14, 1908, collected by William M. Mann.

The variations of *maura* indicate permutations of the characters rather than phyletic segregations. The differences between *maura* and *morionella*, as stated by authors and repeated in the table, do not exactly tally on the score of European specimens before me. The varieties named in the table are distinct enough in their sets of characters, but probably additional specimens from other localities will disclose other combinations lessening the definiteness of varietal limits.

Agromyza maura var. nasuta new var.

Male.—Length 2 mm. Ocellar triangle long, its sides concave, the polished frontal orbits with numerous hairs, only the convergent lowermost two fronto-orbital bristles present. Face with a prominent tubercle present between the antennæ in lieu of a carina, the subantennal grooves deep; vibrissal angle projecting, as is also the greatly excised edge of the epistome. Antennæ reaching below the middle part of the excision of the epistome, the arista three times as long as the last joint. Palpi slender, somewhat curved, but not flattened. Second section of the costa less than four times as long as the third, which is subequal to the fourth section; anterior crossvein at two

thirds the length of the discal cell, the segments of the fourth vein about one to five, the basal section of the fifth vein longer than the outer section.

I have sixteen specimens before me, all males, from Troy, Idaho, Pullman, Washington, and Steiermark, in Europe. The last mentioned were received from Professor Strobl. This variation is most nearly related to *curvipalpis;* it is not the true *maura* nor *morionella*, the males of which have a carinate face and the full set of fronto-orbital bristles.

Agromyza rutiliceps new species.

Male.—Length 2 mm. Shining black, very lightly dusted, the front and vertex except the ocellar triangle and the upper orbits, the face, cheeks, labella, very narrow line on the notopleural suture, halteres, calypteres and their fringe, and the base of the wings reddish to yellow. Antennæ and palpi black. Bristles of head and thorax very long, the ocellar bristles reaching nearly to the antennæ; four pairs of fronto-orbitals; four dorsocentrals, one of them presutural. Abdomen with short close hairs, none of the incisures pale, hypopygium small, concolorous. Legs entirely deep black. Wings hyaline, veins narrowly black, the fourth vein ending beyond the wing tip, its penultimate section one third the length of the ultimate, one and one half times the length of the posterior crossvein and three fourths the length of the ultimate section of the fifth vein; anterior crossvein beyond the end of the first vein.

One specimen, sent in some grass sweepings by William M. Mann, who collected it at Nigger Hill, Powell County, Montana, July, 1912.

Agromyza genualis new species.

♂♀. Length 2.5–3.5 mm. Black, the front, face, cheeks, lower occipital orbits, narrow line bounding the mesopleuræ above and behind, the halteres, calypteres and root of wing, a transverse line below the scutellum, the knees and some of the incisures of the abdomen yellow. Upper frontal orbits and the ocellar triangle blackish. Antennæ and palpi black. Bristles strong, five or six fronto-orbitals, the uppermost somewhat distant from the others, on the orbits besides the fronto-orbitals a row of close minute hairs; ocellar bristles reaching about two thirds the distance to the antennæ; two vibrissæ. Cheeks about one fourth the eye-height. Thorax opaque black, dusted, the bristles and setulæ strong; four dorsocentrals, of which one is in front of the suture; four rows of acrostichals and numerous lateral setulæ present; pleuræ pollinose, meso- and sternopleuræ setulose, one sternopleural and a row of four mesopleural bristles longer, prothoracic bristle large. Abdomen subshining, in the female the hind margin of the fifth segment alone is narrowly yellow, sixth segment of female broad, depressed; male abdomen entirely black, the hypopygium somewhat larger than the distal segments, globular, deeply excised and

with two black linear lamellæ. Legs stout, black, the knees sharply marked with yellow. Fringe of calypteres black. Wings narrow, hyaline, veins strong, the third section of the costa one and one half times the fourth; anterior crossvein beyond the end of the first vein, segments of discal cell two to one, the penultimate section of the fourth vein about one sixth the ultimate, shorter than the posterior crossvein and about two fifths the length of the ultimate section of the fifth vein.

Four males and three females. Powell County, Montana (Wm. M. Mann); Moscow Mountain, Idaho; Mount Constitution, Washington.

Agromyza auriceps new species.

♂♀. Length 2 mm. Black, pollinose, the occiput, thorax and abdomen with grayish tinge, the legs black. Interfrontalia, face, cheeks, labella, halteres and the narrow incisures of the abdomen yellow. Antennæ and palpi black. Vibrissal ridge brown; clypeus black. The narrow frontal orbits black, gradually merging into yellow anteriorly; four fronto-orbitals; ocellar bristles reaching half way to the antennæ. Thoracic setulæ rather fine and long, about four rows of acrostichals; the dorsocentrals scarcely differentiated from the setulæ, except the posterior pair. Notopleural suture very narrowly yellow; a narrow triangular yellow mark descending on the meso-pteropleural suture; one posterior sternopleural and one posterior mesopleural bristle. Calypteres dirty yellow and with blackish fringe. The penultimate segment of the male abdomen somewhat shining, the hypopygium small, globular, its parts not projecting; in the male the incisures of the venter also rather narrowly but uniformly yellow; in the female the incisures of the basal four segments very narrowly of the penultimate segment rather broadly yellow, the ultimate segment shining jet black, compressed, and as long as the preceding three segments together; hairs of the abdomen rather conspicuous, the membrane between the sternites and the tergites yellow. Wings hyaline, veins blackish, rather strong, the second section of the costa two and one half times the third, which is equal to the fourth, the ends of the third and fourth veins diverging; anterior crossvein before the middle of the discal cell, the penultimate section of the fourth vein about one fourth the ultimate and a little longer than the posterior crossvein; the ultimate section of the fifth vein slightly longer than the penultimate section; anal vein strong, nearly reaching the wing margin.

Five males and six females, Moscow Mountain, Idaho; one female, Colorado (C. F. Baker, collector).

This species is probably closely related to *Agromyza Davisii*, recently described by Walton, but can scarcely be the same on account of its weak thoracic bristles.

Agromyza interfrontalis new species.

Female.—Length 1.7 mm. Black, subshining, the center of the front, labella, scutellum except the anterior angles, upper mesopleural sutures, calypteres and root of wings, halteres, and rather narrowly the knees, yellow; laterally the incisures of the basal segments of the abdomen becoming yellowish, and the penultimate segment with an apical yellow band. Front becoming narrower towards the antennæ, the orbits relatively broad and nearly as wide as the interfrontal stripe; ocellar triangle rounded and black, the ocellar bristles small, scarcely reaching one fourth the length of the front. Cheeks piceous black, about one sixth the eye-height; a single vibrissa. Three dorsocentrals, acrostichals very sparse. Last segment of the abdomen rounded, not longer than the penultimate segment, the ovipositor short. No tibial bristles. Margin of the calypteres a little dusky. Wings hyaline, veins dark; third section of the costa longer than the fourth section and about one third as long as the second section; discal cell small, the posterior crossvein opposite the end of the first vein, the anterior crossvein before the middle of the discal cell; segments of the fourth vein proportioned about one to six, of the fifth vein about one to two; the fourth vein ending at the wing tip, subparallel with the third.

One specimen, Tacoma, Washington, August 27, 1912.

Structurally this species is related to *luctuosa* Meigen, from which it differs in the color of the scutellum and of the front.

Agromyza pollinosa new species.

Male.—Length 2 mm. Largely black, overlaid with cinereous brown pollen. Head yellow, the occiput except laterally and below and the round ocellar triangle black. Ocellar bristles reaching three fourths the distance to the frontal suture; four to six pairs of fronto-orbitals; face strongly receding, carinate between the subantennal depressions; cheeks about one third the height of the obliquely oval and pubescent eyes; one vibrissa and three weak oral hairs. Mouth-parts yellow, palpi broad. Antennæ yellow, the third joint subreniform, the arista yellowish at its base. Pleuræ and notum subopaque, with grayish pollen; the narrow notopleural and meso-pteropleural sutures yellow; bristles long, four dorsocentrals, four rows of acrostichal setulæ. Abdomen subshining, the lateral membrane yellow; hypopygium relatively large, with two rather long, narrow lamellæ in the apical excision. Apex of the coxæ and the broad knees yellowish; middle tibiæ without extensor bristles. Halteres, calypteres and root of wing yellow; wings hyaline, narrow, the veins slender but dark; third section of costa longer than the fourth and about one fifth as long as the second section; anterior crossvein just beyond the end of the first vein and just beyond the middle of the discal cell; sections of fourth vein about one to five, of the fifth vein subequal.

Two specimens from grass sweepings gathered by Professor Wm. T. Shaw at Sitka, Alaska, July 16, 1907.

Agromyza pacifica new species.

♂♀. Length 1.5–2 mm. Pale yellow, the following parts black, cinereous dusted; middle of occiput, disk of mesonotum, leaving the sides broadly and a large prescutellar spot yellow, metanotum largely, spots at base of posterior coxæ, that on the sternopleuræ large and triangular, and also the hypopygium black. The last abdominal segment of the female is short and jet black. Third antennal joint, arista except base, front of clypeus, and small irregular spots on pleuræ black or blackish. Front rather broad, quadrate, three fronto-orbitals, ocellar bristles reaching two thirds the distance to the antennæ; face not carinate; cheeks one fourth the eye-height; vibrissa longer than the sparse oral hairs. Four dorsocentrals, setulæ very sparse but long, acrostichals in two irregular rows; three mesopleural bristles present in a vertical posterior row, the center one longest. Calypteres with dusky margin and fringe. Legs less pure yellow, no tibial bristles. Centers of abdominal tergites a little dusky. Wings hyaline; third section of costa subequal to the fourth and a little more than one fourth the extent of the second section; anterior crossvein just beyond the termination of the first vein and beyond the middle of the discal cell; fourth vein ends beyond the wing tip, its sections one to six; basal section of the fifth vein somewhat shorter than the apical section.

One male, six females. Bellingham and Mount Constitution, Washington; Douglas, Alaska (E. L. Jenne).

Agromyza varia new species.

Female.—Length 2 mm. Largely blackish, the following parts yellow; front, face, cheeks, occipital orbits below, proboscis, broad sides of mesonotum, sutures of pleuræ, lateral membrane of abdomen, narrow apex of penultimate abdominal segment, root of halteres and underside of anterior femora. Remainder of the body black or blackish, including the antennæ, entire arista, palpi, ocellar triangle, occiput, disk of mesonotum, scutellum except its apex, most of pleuræ, margin of calypteres, knob of halteres, the abdomen, of which the short terminal segment is jet black, and most of the legs. Front square, three strong fronto-orbitals, ocellar bristles reaching two thirds the distance to the antennæ; face rather flat, cheeks one third the eye-height; vibrissa a little longer than the five oral hairs. Four dorsocentrals, acrostichals very sparse, in two irregular rows; two mesopleural bristles and a few additional setulæ. No tibial bristles. Wings hyaline; the third section of the costa longer than the fourth and about one third as long as the second section; anterior crossvein before the end of the first vein and beyond the middle of the discal cell; fourth vein ending at the wing tip, its sections about one to seven; basal section of the fifth vein two thirds as long as the outer section; posterior crossvein equal to the penultimate section of the fourth vein; auxiliary vein ending much before the end of the first vein.

One specimen, Moscow Mountain, Idaho, June 12, 1910.

This species is structurally very close to *pacifica*, differing but slightly in the neuration. The setulæ of the mesopleuræ are less evident in *pacifica* and the arista is less robust and more openly pubescent. The blackened knob of the halteres is unusual for this section of the genus.

Agromyza clara new species.

Male.—Length 1 mm. Face, cheeks, lower occiput, lower front, antennæ, mouth-parts, halteres, legs and most of pleuræ whitish to pale yellow. Upper occiput, vertex, mesonotum except lateral margins, scutellum, metanotum except a subscutellar cinereous line, spots on sternopleuræ and hypopleuræ, and abdomen except very narrow incisures, black or blackish. Front very broad and square, with three fronto-orbitals; the ocellar bristles reaching about one third the distance to the antennæ; face greatly receding, nearly flat; antennæ porrect rather than decumbent; cheeks about one half the eye-height, a single vibrissa and a single oral hair present. Apparently three dorsocentrals present, acrostichals very sparse; pleuræ not setulose. Calypteres with dusky margin and fringe. Tarsi a little darkened; no tibial bristles. Wings hyaline, veins rather strong and dark; third section of costa equal to fourth and about one fourth the length of the second section; discal cell small, the anterior crossvein before the end of the first vein, and beyond the middle of the discal cell; fourth vein ending at wing tip, its segments about one to ten; basal section of fifth vein but little more than one half the length of the distal section.

One specimen, Mount Constitution, Orcas Island, Washington, July 31, 1908.

Agromyza lima new species.

Male.—Length 1.5 mm. Yellow and black in color, the following parts of the body are pale yellow; head, except center of occiput, most of pleuræ, sides of mesonotum, most of scutellum, incisures of abdomen, antennæ, mouth-parts, halteres, calypteres, root of wings, and most of legs. The following parts of the body are black and more or less overlaid with grayish pollen; small ocellar triangle, occiput except orbits, a humeral spot, disk of mesonotum extending to the scutellum and scarcely notched along the sides, spot in meso- and sternopleuræ, the last-mentioned largest; basal angles of scutellum, metathorax largely, and abdomen mostly, except narrow incisures and broader sides of the segments; the hypopygium is also black. Front slightly longer than broad and narrower toward the antennæ; three or four small fronto-orbitals; ocellar bristles reaching about one third the length of the front. Antennæ reaching half way to the epistome, the arista two times the length of the third joint, its base yellowish. Face moderately carinate; cheeks nearly as deep as the eye-height; vibrissæ not longer than the four or five oral hairs. Two dorsocentrals, no setulæ; meso- and sternopleuræ bare except for the single small

bristle on each. Femora pale yellow, tibiæ and tarsi testaceous, no tibial bristles. Wings hyaline, veins dull yellowish; the third section of the costa subequal to the fourth and one fourth the length of the second section; the fourth vein ends at the wing tip, its sections about one to six; discal cell small, the anterior crossvein before its middle and before the end of the auxiliary vein, the posterior crossvein just beyond the end of the first vein and shorter than the second section of the discal cell; basal section of the fifth vein one half as long as the outer section.

Female.—Slightly larger, about 2 mm. in length. The abdomen is blacker, the incisures scarcely yellow, except the apical margin of the penultimate segment; the ultimate segment is jet black, cylindrico-conical, about as long as two of the middle segments together, the ovipositor short, tubular.

Three males and four females, Moscow Mountain, Idaho, July, 1911 and 1912.

Liriomyza tubifer new species.

Female.—Length 2 mm. Shining yellow except the following parts black: occiput except the lower orbits and oral portion, small ocellar spot, center of mesonotum broadly but with narrow incisions above the humeri, at the suture and in back on the intra-alar stripe, and with a broad quadrate emargination before the scutellum (laterally and posteriorly the mesonotum is yellow), small black spots on humeri, notopleural suture, mesopleuræ below and above hind coxæ, and a large triangular black spot on the sternopleuræ, also the metanotum and the large ovipositor black. The abdomen is yellowish, with broad brown fasciæ on the middle of the segments. Front very little longer than wide, with four fronto-orbitals, the upper one reclinate and distant from the lower converging smaller three; ocellar bristles extending down one third the length of the front. Antennæ not reaching the epistome, the arista coarse and black. Mouth-parts yellow. The vibrissa scarcely differentiated from the row of five oral hairs. Two dorsocentrals; about six rows of fine acrostichals; one presutural. The last abdominal segment as long as the preceding three, compressed near the base, the cylindrical ovipositor projecting. Coxæ and femora pale yellow, the tibiæ and tarsi blackish; no tibial bristles. Halteres yellow; calypteres with dark fringe. Wings hyaline; the third section of the costa two thirds as long as the fourth section and about one sixth as long as the second section; the anterior crossvein before the end of the first vein and at the middle of the small discal cell; the sections of the fourth vein proportioned one to seven, of the fifth vein two to three; posterior crossvein oblique, opposite the end of the first vein and shorter than the front sections of the discal cell.

One specimen, Hayti.

The genus *Liriomyza*, established by Mik for a species with long ovipositor, is hardly tenable. The present species, aside from the ovi-

positor, would be considered merely a color variation of *Agromyza melampyga*. It is doubtful if the males would offer structural differences from ordinary Agromyzas, and, moreover, the length of the ovipositor and of the last abdominal segment of the female is a variable character among the several species.

NOTES ON SOME SPECIES OF *Agromyza*.

Agromyza curvipalpis Zetterstedt. The European specimens I possess have the veins thinner than in the majority of the American specimens. One male from Woods Hole, Massachusetts, is larger, the head a little sturdier and the lateral shining stripes of the front are narrower than usual, including the orbits from the eyes *to* the frontal bristles. Usually the frontal bristles are located upon the brightest part of the shining stripes. Various authors mention the porrect curved palpi of the male. In all my males the palpi are not especially conspicuous. The females are separable from *maura* with great difficulty. The best character seems to be the relative denseness of the pubescence on the frontal orbits. In *maura* these hairs grow dense and are easily seen under a high magnification.

Agromyza dimidiata Walker. This species was described as a *Phytomyza,* but was thought by Coquillett to be the same as *trifolii,* which is *scutellata*. The brief description makes identification impossible.

Agromyza invaria Walker is unrecognizable from the description.

Agromyza lacteipennis Fallen. This European species was reported by Coquillett as occurring in Alaska. It belongs to the Milichiine genus *Meoneura,* as has already been noticed by Hendel,[1] and is specifically the same as *vagans* Fallen. It is of common occurrence in the northwest.

Agromyza neptis Loew might be confused with *parvicornis* Loew, which it greatly resembles. *Neptis* has the wings more slender, with the front and hind borders more nearly parallel and the veins darker; the marginal cell is about four times as long as the submarginal along the costa; in *parvicornis* it is about three times as long. The veins at the base of the wing are dusky and not yellowish. The arista is scarcely twice as long as the antennæ and is microscopically pubescent.

[1] Wiener entomologische Zeitung, XXX, 35 (1911).

Agromyza parvicornis Loew. The veins are usually yellowish, especially pronounced on the basal half of the wing. The arista is visibly pubescent and fully two and one half times as long as the antenna. See note under *neptis*.

Agromyza sorosis Williston. I have a specimen received from Dr. Williston's collection, from Piedro Blanca, Bolivia, April, which has the pubescence of the arista more distinct than in the specimens from the states.

Agromyza sulphuriceps Strobl. Although I have no European material for comparison, I place six specimens from Troy, Idaho, and Kamiac Butte, Washington, in this species. They agree so thoroughly with Professor Strobl's description that it would add nothing to the knowledge of this genus to bestow a new name on these flies. The species is apparently very close to *varifrons* Coquillett, and possibly is the same. The differences given in the table, all that is tangible in the descriptions, are probably more apparent on paper than real in nature.

Agromyza tæniola Coquillett. This may be a variation of *grossicornis*. Coquillett's type from California has three dorsocentrals, the third antennal joint very small and the mesonotum not pruinose. I have specimens that agree in other particulars with the description of *tæniola*, but have four dorsocentrals of varying size, and the mesonotum lightly pollinose.

Agromyza tiliæ Couden. This species was described from material reared from stem galls of the American linden. It is very close to *simplex* according to Coquillett and Couden, the only discernible differences being the position of the frontal bristles and the shape of the ocellar triangle. As both of these characters are quite variable in other species of this genus, the form *tiliæ* may be included with *simplex* as variations of the broad species *maura*. The shining frontal triangle is large, elongate and has its sides concave; the lower four frontal bristles are close together and well separated from the upper bristle. The two sections of the fifth vein are equal, as in *simplex*, but the space between the crossveins is greater, ranging from one half to nearly the length of the posterior crossvein. I have a specimen presumably belonging here, from Montreal Island, Quebec, received from G. Chagnon. The lower frontal bristles, however, are not so crowded as pictured for *tiliæ*. The specimen has the frontal

lunule cinereous, differing in this respect from the other specimens of *maura*. The face is receding and slightly carinate, and the tip of the abdomen is bronzed.

Agromyza tritici Fitch. Length 2 mm. Black, the lower part of the front and the oral margin yellowish; legs blackish; knees yellow; fourth vein evanescent beyond the small discal cell. New York. The description is too brief to place this species in the table. It suggests *Meoneura* or *Napomyza* rather than *Agromyza*. The figure shows the costa stopping at the third vein.

TABLE OF THE SPECIES OF *Phytomyza*.

Front narrow; third antennal joint ending in a point, as in *Cerodonta;* third vein ending far before the tip of the wing. (Eur.; Wash.*)
acuticornis Loew.

Front normally broad; the third antennal joint not pointed................2.

2. Front principally black or cinereous; antennæ black..................3.
Front and cheeks largely yellow....................................11.

3. Abdomen yellow, except the tip; thorax and legs opaque cinereous black; mesonotum densely hairy between the bristles. (N. Y.*)
bicolor Coquillett.
Abdomen mostly black (sometimes the incisures narrowly yellow); mesonotum not densely hairy ....4.

4. Frontal orbits whitish, contrasting with the brownish central portion of the front; anterior dorsocentrals small; cheeks one-sixth the eye-height; arista slender. (Id.,* Wash.*)..............*orbitalis* n. sp.
Front blackish, the orbits concolorous; four dorsocentrals..............5.

5. Frontal orbits, thorax and abdomen shining; wings nearly hyaline......6.
Frontal orbits opaque; thorax more or less dusted; four fronto-orbitals. (*obscurella* Fallen.) ....7.

6. Entirely black, except the halteres and proboscis; veins blackish up to the base; three fronto-orbitals; fringe of calypteres black; third antennal joint shorter than deep. (N. Y.,* Id.*)................*nitida* n. sp.
Legs partly fuscous; base of wings and notopleural suture yellowish; four fronto-orbitals; fringe of calypteres yellow; third antennal joint longer than deep. (D. C., Ont.*)................*clematidis* Loew.

7. Wings lightly clouded, especially in front; mesonotum subshining; cheeks fuscous. (Eur.; Wash.*)....*obscurella* var. *nigripennis* Zetterstedt.
Wings not with fuscous tinge, the marginal cell not brownish...........8.

8. Cheeks black; abdomen and legs generally black......................9.
Cheeks brown; sides of abdomen, some of the incisures, and the knees generally yellowish ....10.

9. Knees paler; second section of the costa four times longer than the third

section, the third vein ending a little in front of the tip of the wing; abdomen subopaque. (Eur.;* Greenl., Cal., Id.,* Wash.*)

obscurella Fallen, sens. str.

Legs black; the second section of the costa about three times longer than the third section, the third vein ending much before the tip of the wing; abdomen more shining. (Eur.;* Greenl., Id.,* Wash.*)

obscurella var. *nigritella* Zetterstedt.

10. Thorax opaque, cinereous dusted, with a faint yellowish humeral spot. (D. C., Mass., Cal., Ore., Wash.,* Alaska.)

obscurella var. *ilicicola* Loew.

Thorax subshining, slightly dusted, no humeral spot. (Eur.;* Id.,* Wash.,* Alaska.*) .... *obscurella* var. *nigra* Meigen.

11. Antennæ yellow, the third joint sometimes infuscated .... 12.

Antennæ black, or at least the third joint entirely black .... 14.

12. Cheeks broader than the eye-height; the third antennal joint elongate-oval; pleuræ and legs yellow. (Ill.*) .... *genalis* n. sp.

Cheeks narrower than the eye-height; the third antennal joint short-rounded .... 13.

13. Third antennal joint bluntly rounded, pubescent and dusky; pleuræ, abdomen and legs yellow. (Eur.; Ind.*) .... *analis* Zetterstedt.

Third antennal joint minute and bare; pleuræ, abdomen and legs black, but variegated with yellow. (Eur.;* Ohio, Ill., Alaska.)

flavicornis Zetterstedt.

14. Femora in part at least yellowish; base of antennæ yellow; lateral margins of thorax at least broadly yellow .... 15.

Femora black, except the knees; antennæ entirely black or dark brown; blackish species .... 19.

15. Wings dark, veins blackish; scutellum cinereous black; opaque black species. (D. C.) .... *nervosa* Loew.

Wings hyaline; scutellum yellow, or at least usually yellow in the middle; species often yellow .... 16.

16. Body subshining; mesonotum marked with four brown vittæ, the middle pair scarcely extending beyond its middle. (Tex.)

clemativora Coquillett.

Body opaque dusted; mesonotum marked with cinereous black. (*flava* Fallen.) .... 17.

17. Pleuræ, abdomen and legs largely yellow .... 18.

Pleuræ, abdomen and legs largely black. (Eur.;* Greenl.)

flava var. *zetterstedti* Schiner.

18. Pleuræ, except part of the sternopleura, yellow; abdomen yellow; mesonotum with two narrow yellow vittæ dividing the dark color into three parts. (Eur.;* Wash.*) .... *flava* Fallen sens. str.

Pleuræ with the dark color more extended; abdomen sometimes dusky in part; yellow stripes of the mesonotum not evident. (Eur.;* Id.,* Ore.*) .... *flava* var. *flavoscutellata* Fallen.

19. Sides of thorax and the humeri broadly yellow. (Eur.;* Id.,* Wash.*) *bipunctata* Loew.
Notopleural suture narrowly yellow, humeri not yellow..............20.
20. Mesonotum, pleuræ and abdomen subshining; bristles fine; arista short-pubescent. (Eur.; Conn.,* D. C., Ill.,* Id.*).......*aquilegiæ* Hardy.
Notum and pleuræ opaque cinereous black; bristles coarse.............21.
21. Arista much thickened and closely pubescent; usually three fronto-orbitals. (Eur.; Id.,* Wash.*).......................*crassiseta* Zetterstedt.
Arista slender, as usual ....22.
22. Arostichals present; ovipositor longer than the last abdominal segment.23.
Acrostichals absent; ovipositor shorter than the last segment; incisures yellow. (N. Y., Mass.,* Conn., Pa., N. J., B. C.*).*chrysanthemi* Kowarz.
23. Incisures of the abdomen conspicuously yellow. (Eur.;* Greenl., Id.*) (*solita* Walker?) ....*affinis* Fallen.
Incisures not yellow, only the last segment banded. (Eur.;* Mass., N. Y., D. C., Ont., Id.,* Ore.,* Wash.,* Cal.*) (*genualis* Loew.) *albiceps* Meigen.

Phytomyza orbitalis new species.

♂♀. Length 1.5 mm. Black, with a slight brownish tinge, lightly dusted. Frontal orbits marked with a yellow stripe bearing the bristles. Proboscis, notopleural suture broadly, humeri, some of the abdominal incisures narrowly, knees, tarsi and root of wings more or less dark brownish. Humeral callus sometimes yellowish. Halteres whitish yellow. Four fronto-orbitals; center of front opaque, but sometimes brownish; cheeks one sixth the eye-height; vibrissa not much stronger than the oral hairs; third joint of antennæ rounded-ovate, scarcely pubescent, the arista microscopically pubescent, two times the length of the third antennal joint. Five dorsocentrals, of which one is presutural, but the anterior three weak and scarcely differentiated from the setulæ; four scattered rows of acrostichals; two sternopleurals, the large mesopleural near the top of the row. Last abdominal segment short, conical. Fringe of calypteres dusky; wings nearly hyaline, the fourth vein nearly straight, ending beyond the wing tip, the third section of the costa but little shorter than the following section.

Twenty-two specimens, from Collins, Troy and Moscow Mountain, Idaho, and from Pullman, Kamiac Butte and Oroville, Washington; May to August, but most of the specimens taken in June.

The species is structurally very much like *obscurella* Fallen. The arista, however, is more slender and less perceptibly pubescent, the cheeks are narrower and the dorsocentrals are less pronounced.

Phytomyza nitida new species.

♂♀. Length 1.3 mm. Black, rather shining, the proboscis, halteres and root of wing whitish. Two or three fronto-orbitals; the vibrissa no longer

than the oral hairs. Eyes large, leaving the cheeks about one fourth the eye-height. Third joint of antennæ orbicular, not hairy, the arista about twice the length of the third joint. Four small dorsocentrals, the acrostichals minute; one fine mesopleural and one sternopleural bristle, no setulæ. Terminal segment of abdomen of female short. Calypteres with dusky margin and fringe. Wings lightly infumated, the fourth vein ending at the wing tip or just beyond, the fourth section of the costal margin about twice as long as the third.

Five specimens from the Cedar Mountains of Idaho, taken at Troy, Bovill and Moscow; and one from White Plains, New York, the last mentioned specimen collected by J. R. de la Torre Bueno.

This species is apparently close to *morio* Zetterstedt, but the wings are not white. It differs from the related *obscurella* Fallen and *orbitalis* n. sp. in having three fronto-orbitals, the dorsocentrals and especially the acrostichal and other setulæ weak, and the pollinosity greatly reduced.

Phytomyza genalis new species.

♂♀. Length 2.5 mm. Robust, yellow, the ocellar triangle, occipital spot, disk of mesonotum, the scutellum and metanotum, a fainter spot above the posterior coxæ, and in the female the bases of the abdominal segments, cinereous black; ovipositor and apical half of preceding segment shining jet black. Eyes small, rounded-oval, the front and cheeks broad, the latter comprised largely of the obliquely descending genæ: four fronto-orbitals; vibrissa small. Antennæ yellow, elongate, the third joint one half longer than deep, nearly bare, the black, bare arista two and one half times as long as the third joint. Mouth-parts yellow. Four long dorsocentrals, two rows of sparse acrostichals, one long mesopleural. Tarsi a little dusky. Halteres yellow. Calypteres with a dense dusky fringe. Wings brownish hyaline, root of first vein yellow, the fourth vein straight, ending just beyond the wing tip.

Two specimens, Chicago, Illinois.

The species resembles *analis* Zetterstedt, but has much smaller eyes, longer antennæ, dark scutellum, and in the female a fasciate abdomen.

NAPOMYZA Haliday.

Anterior crossvein at two thirds the length of the small discal cell, the last section of the fifth vein about five times as long as the preceding section .... 2.

Discal cell minute, the posterior crossvein nearly opposite the anterior; ultimate section of the fifth vein eight or more times as long as the preceding section .... 3.

2. **Four dorsocentrals**; thorax opaque gray pruinose; head largely black; legs **black, except** the knees. (Alaska.) (*Agromyza.*).*parvicella* Coquillett.[1]
   Dorsocentrals weak, thorax somewhat subshining, the sides broadly yellow; **head yellow** except the occiput; anterior tibiæ and tarsi yellowish. (Id.*) ....*plagiata* sp. nov.
3. **Posterior crossvein** in front of the anterior crossvein; ovipositor depressed; opaque black species with fuscous head, pale knees, notopleural stripe and incisures of abdomen (Eur., Id.,* Wash.).....*anomala* Strobl.
   Posterior crossvein opposite the anterior crossvein; ovipositor compressed; mostly cinereous black, the head yellowish. (Eur.;* N. H., Ill., Mo., Col.,* Alaska.) ....*lateralis* Fallen.

Napomyza plagiata new species.

Female.—Length 2.5 mm. Robust, opaque blackish, the front, face, cheeks, lower occipital orbits, proboscis, broad sides of the mesonotum, parts of the pleuræ, narrow apical margins of the first, second and fifth abdominal segments, root of wings, calypteres, knees, anterior tibiæ and the tarsi yellowish; knob of halteres whitish. Front broad, a little dusky towards the antennæ, four fronto-orbital bristles; antennæ brown, the third joint round, with short pubescence, arista blackish, two times as long as the third joint, minutely pubescent. Cheeks at the middle one fifth as deep as the eye-height, the vibrissæ not larger than the oral hairs. Anterior dorsocentrals scarcely larger than the adjacent setulæ, acrostichals in four very irregular rows; one sternopleural and one mesopleural bristle. Last segment of the abdomen transverse and polished, the ovipositor short, broad, depressed and deeply scabrous. margin and fringe of calypteres dusky. Wings nearly hyaline, veins brown, the fourth vein ending just beyond the wing tip, its sections about one to twenty, the sections of the fifth vein proportioned about one to five, the anterior crossvein at two thirds the length of the discal cell.

One specimen, Avon, Idaho, July 26, 1912.

(Continued in the December number.)

MISCELLANEOUS NOTES.

Drosophila repleta Woll.—This strikingly colored fly, better known in America as *D. punctulata* Loew, has an extended tropical and subtropical distribution and has even been taken in New York City. Specimens recently determined through the kindness of Professor J. M. Aldrich, Moscow, Idaho, show that this species was taken in Albany in September and October, 1908, and also reared the preceding

[1] *Agromyza tritici* Fitch is apparently closely related.

September from a jar containing galls of *Asphondylia conspicua* O. S. received from Highspire, Pa. The above records show that this species may range as far north as Albany, probably being carried thither in shipments of tropical fruit, though the rearing from this gall would indicate a probability of the insect breeding locally in certain vegetable tissues if conditions were favorable.—E. P. FELT.

Blow Fly Studies.—An investigation of certain local blow flies resulted in rearing large numbers of *Phormia regina* Meigen, which appears to be the most common blow fly in the vicinity of Albany, and also a flesh fly, *Sarcophaga georgina* Wied., both of which were kindly determined for us by Mr. C. W. Johnson, of the Boston Society of Natural History. The rearing of these flies incidentally shows that the maggots of both were negatively heliotropic, this being especially marked in the case of those half to full grown. It is commonly stated that blow fly maggots burrow into carrion, a habit explained by their aversion to light rather than the necessity of obtaining food. Colonies of maggots reared in almost total darkness habitually remained on the surface of the food supply in large masses, sometimes over an inch in depth and two to even four inches in diameter. The larvæ, under such conditions, were moving continuously over each other, quickly scattering and seeking shelter on exposure to light. The clustering is probably to be explained on a mechanical basis, since the smooth mucus body walls of the maggots afford less resistance to motion than almost any other material with which they would come in contact. A somewhat similar massing has been repeatedly observed in the case of the European *Sciara thomæ* Linn. or *S. militaris* Now., and more recently, in this country, of *S. sciophila* Lw. A somewhat analogous case is to be seen in the massing of *Miastor* larvæ under the bark or decaying trees. In each instance we are inclined to favor a mechanical explanation as the more reasonable cause of the phenomenon.—E. P. FELT.

Mites and a Fly.—Some six specimens of a moderate-sized mite, probably an undescribed species of *Seius*, according to Mr. Banks, of the National Museum, were found on the abdomen of *Helobia punctipennis* Meigen, some four being ranged one behind the other on the abdomen. The fly was so small that there was very little room for additional specimens unless they had attached themselves to the under

side of the abdomen or other parts of the body. Mr. Banks was of the opinion that the mites were using the fly simply for migratorial purposes and were not parasitic in any sense of the word.—E. P. FELT.

Platypus punctulatus Chap.—Numbers of this Central American borer were taken last August on mahogany logs which had been shipped around the Horn from Panama and were then in a lumber yard at Astoria. The beetles were coming out in large numbers and attacking freshly sawn sappy mahogany in the yards, running longitudinally, and in some instances vertical galleries into the wood. It was estimated that the injury in early August was as high as $200 per day. Another Ambrosia beetle, namely, *Xyleborus torquatus* Eich., was also taken in some numbers on the mahogany logs. With the above were associated species of *Aulonium bidentatum* Fabr., *Xuthia brevipes* Sharp and *Palorus melinus* Herbst. The Scolytids were kindly identified by Dr. Hopkins through the courtesy of Dr. Howard, while the other Coleoptera were determined by Dr. Schwarz, both of Washington.—E. P. FELT.

PROCEEDINGS OF THE NEW YORK ENTOMOLOGICAL SOCIETY.

MEETING OF APRIL 1.

A regular meeting of the New York Entomological Society was held April 1, 1913, at 8.15 P. M., in the American Museum of Natural History, Vice-President Charles L. Pollard in the chair and twelve members present.

The field committee announced an excursion to the swamp near Roselle Park, N. J., on Sunday, April 13, Mr. Harry G. Barber, guide.

Mr. William T. Davis read a paper on "The Species of *Conocephalus* to be found in New Jersey," which will be printed in the JOURNAL.

The paper was discussed by Messrs. Engelhardt, Leng and Dr. Southwick, the latter recalling the loud noise made by these insects, which he said could be heard above the roar of a train.

Dr. Lutz recalled the Greek myth by which the goddess Aurora, becoming enamoured of the mortal Tithonius, secured for him the gift of immortality, but forgot to include eternal youth, so that eventually he shriveled to nothing but voice, which is still heard in the stridulation of these grasshopper-like insects.

Mr. Davis, recalling the days before the Greeks, commented upon the entomological skill of Noah, supposing that he succeeded in selecting a ♂

and ♀ of each species of insect as passengers in the Ark, a task still quite difficult to perform.

Dr. Lutz read a paper entitled "Notes on *Bombus*," in which he reviewed the structural and color characters of *Bombus* and *Psithyrus* and explained the system of cards he used to aid in their identification. The boreal character of their geographical distribution was noticed and some features of Franklin's recent paper pointed out, especially the curious accident by which a species of the group was dedicated to Professor Fernald, while the species parasitic thereon was named in honor of Mrs. Fernald.

The paper was discussed by Mr. Davis, who recalled the great scarcity of bumble bees in South Florida; by Messrs. Leng and Engelhardt, who described their sudden appearance in Labrador with the first breaking of sunshine through the fog; by Messrs. Dow, Woodruff and Engelhardt in reference to the difficulty of finding large nests, few of which have therefore been bred out in this country. It was suggested that mowing the grass or walking through it barefoot was one way of finding the nests. Mr. Engelhardt spoke of his experience in attempting to dig a nest out of a stone wall which he did not complete, and of the possibility of transplanting nests for study.

Dr. Lutz said the difficulty in finding large nests was in part explained by the fact that some species made only small nests, and exhibited a nest found by Dr. Crampton with specimens of each stage.

Mr. Leng read a paper on the Carabidæ of Florida, to be printed in conjunction with the list of species, which was discussed by Messrs. Angell, Davis, Engelhardt, Grossbeck, Pollard and Dr. Lutz.

Mr. Angell exhibited his series of *Cychrus elevatus*, including a specimen of var. *tenebricosus* labeled Florida, and mentioned that the capture of *Calosoma splendidum* by Brownell at Key West was a unique experience.

Mr. Engelhardt said that in his experience the activity of Florida insects in November depended on weather conditions, some nights having been very good for collecting at night, and followed the next day by excellent beach collecting.

Mr. Grossbeck spoke of *Leptotrachelus dorsalis* being recorded as hibernating in cattails, though perhaps not so closely connected with the plant as *Onota floridana* with the palmetto.

Mr. Davis exhibited a series of *Cychrus elevatus* collected in Cape May Co., N. J., on a flat meadow, far from any trees; and spoke of the environment in which Carabidæ were found in South Florida, Chokoloskee being an island of about 105 acres, of which the nucleus was a clump of mangroves growing out of the salt water, about which soil had gathered, similar to many such islands in the Ten Thousand Islands, where the growth of the west coast may now be seen in progress, but in the case of Chokoloskee aided by Indian shell mounds. Everglade, on the contrary, is on the mainland, very flat and but slightly elevated above high tide, so that it is sometimes inundated during storms, and populated by fiddler crabs at all times, which may be seen walking in the garden. The salt meadow bounds the little elevation on the south side,

mangrove swamps on east and west, and Allen's River on the north, and so completely between them that domesticated turkeys must perforce stay home, finding no shelter in the impenetrable, slimy mangrove swamps if they try to wander. Some of the buildings at Everglade are raised 6 or 7 feet on concrete piers, so that storm-driven seas may sweep under them instead of carrying them away.

Ten miles northeast from Everglade, on the way to Deep Lake, a very low ridge is crossed which bears a different vegetation, including sufficient pine to have caused the local name of Pine Island for it. At Deep Lake oaks and red maples are found. Such elevations are usually accompanied by an exposure of the underlying limestone rock with the characteristic holes.

At Lake Okeechobee the shady side of a house boat on the shore of South Bay afforded extraordinary collecting of Carabidæ. There a quantity of refuse from the house boat had been thrown. A cornfield back of the hotel afforded more collecting, including many Noctuidæ. On the journey between Lake Okeechobee and Fort Myers, a ridge like that noted at Pine Island could again be observed, being central at LaBelle.

Mr. Davis showed photographs of these places, one taken by Mr. Grossbeck, showing Dr. McDonough enveloped in mosquito net, as a silent tribute to the ferocity and number of such insects throughout the swamps.

Mr. Pollard spoke of the Cuban species of pine found on some of the keys, and Mr. Engelhardt commented on the forests of pine noted at intervals on the east coast to the southern extremity of the peninsula. Mr. Davis remarked that several species were peculiar to Florida, their distribution being given by Sargent.

Dr. Lutz showed a photograph of pines at Cow Creek and read an extract in relation to the supposed formation of Florida sandhills by wave action while submerged.

Mr. Dow read extracts from letters he had received from Dr. Walther Horn (referring to the re-discovery of part of the Motschulsky collection), Colonel Casey, Charles Dury and other entomologists.

MEETING OF APRIL 15.

A regular meeting of the New York Entomological Society was held April 15, 1913, at 8.15 P. M., in the American Museum of Natural History, President Dr. Raymond C. Osburn in the chair and eleven members present.

The curator exhibited the progress made in the local collection of galls as arranged by Mr. Mutchler, and called attention especially to the device, consisting of companion boxes, by which it became possible to show together the gall insects and the galls. The galls were loose as usual, each species in a box, and the insects in an adjoining cork-lined smaller box, all proportioned so that the drawer in which they were contained was filled.

The president opened the Symposium on Insects on Plants (including Fungi).

Mr. Leng read a paper on "Coleoptera on Plants," in which he cited the

work of Dr. Sandor Gorka on the alimentary canal, and pointed out that three primary classes, beetles feeding on decaying substances, beetles feeding on living plants, and beetles feeding on living animals, could be recognized and correlated with different types of digestive system as well as with differences in external structure. In each of the three classes, aquatic and terrestrial divisions would be found, with well-marked adaptive structures, and in each would also be found more or less developed parasitic forms, also characterized by structural adaptations. Societies of species, similar to those discovered in plants, could be defined by the parallel adaptations of their external and internal structures, but such would be found to revolve about the food habit rather than considerations of moisture.

Mr. Davis, commenting upon these statemens, said that Carabidæ and Cerambycidæ, though contrasted by Mr. Leng in respect of food habit, were equally attracted by sugar bait.

Dr. Osburn said the Gorka statement that the longest alimentary canal in beetles was correlated with the least nutritious food was corroborated by the known fact that in fishes the purely herbivorous fishes have a long alimentary canal, and in one species it is so long that it is wrapped many times about the air bladder.

Mr. Davis said that ants extract the liquid diet they require from both animal and vegetable matter.

Mr. Weeks said that the Carabidæ found at sugar were predaceous insects and that he had often seen *Calosoma* attack other insects attracted by sugar.

Dr. Lutz called attention to the List of Food Plants compiled by Mr. Mutchler along the lines suggested some time ago by Dr. Southwick, in which the insects attacking each plant are listed as well as the plants attacked by each species. Commenting upon Mr. Leng's paper Dr. Lutz said the great difficulty was that no society governed by local environment would be constituted on the lines suggested, the only approach to such being the recognition of two main environments in the aquatic and terrestrial divisions. The importance of food as one of the factors must be admitted, but only as one of many, and certainly not to the exclusion of moisture, light and probably other influences that had not been mentioned. Continuing, Dr. Lutz said that while the word societies had been used in a broad sense, the word association had been used for more limited groups and in illustration spoke of the various species of insects associated with the pitcher plant, which offered opportunities for further interesting work.

Another interesting example could be found in the Bromeliad insects, in connection with which he referred to the paper in the Annals and Magazine of Natural History, by Scott, Distant and Shelford, in which the small bodies of rain water and condensed dew retained by the curious funnel-like, closely fitting leaf bases of these plants (of which the pineapple is an example) are compared to "a great fractional swamp spread all over tropical America," in the words of Picado. He also referred to Calvert's paper on Costa Rican Odonata in Entomological News, dealing with the same subject; and said that the dragon fly breeding in these places, with the female body greatly

elongated to permit of oviposition in such a deep funnel as the environment requires, the cockroaches, earwigs, katydid-like insects, beetles, etc., inhabiting the same, are grouped into a unit consisting of various organisms found together and under the same environment.

Mr. Engelhardt exhibited the thorn and fruit of an *Acacia* from Guatemala with several specimens of *Bruchus* he had found in the seeds, a species very similar if not identical with our *Spermophagus robiniæ*.

Mr. Barber, after showing a new binder for pamphlets, said that the Homoptera were almost exclusively plant feeders but the Heteroptera exhibited more differentiation, many being predaceous, and all the aquatic forms undoubtedly carnivorous. Of fungus feeders only the Aradidæ could possibly be cited, and those with some doubt on his part.

Mr. Davis exhibited a number of galls caused by the irritation of the Cecidomyid larvæ, and commented on the judgment with which the female always laid an appropriate number of eggs. He spoke of a gall on *Rudbeckia* as large as a man's fist sheltering insects of three orders, including the Hymenoptera parasitic on the other insects, and particularly of oak galls and rose galls, commenting on the two kinds of oak galls shown and the ten species of rose galls known to him. In conclusion he called attention to the erroneous figure on page 599 of Smith's List and the misleading statements sometimes made in reference to female gall insects.

Mr. Grossbeck said that almost all Lepidoptera fed on leaves, about 200 being known as borers in roots and stems and in addition perhaps half the Tineids being leaf miners or feeders on dried fruits and other dry vegetable matter. He spoke of the preference for oak, willow, poplar, wild cherry, etc., exhibited by Lepidoptera and comparative disfavor in which sycamore, beech and alder are held, while the Noctuidæ particularly affect herbaceous plants and grasses.

Dr. Osburn, speaking of the Syrphidæ, instanced *Volucella* as feeding on soft-bodied cacti, *Microdon* in bulbs of *Narcissus* and *Eumerus* in onion bulbs, and referred to the variation in size noted in *Pemphus*.

Mr. Leng, replying to Dr. Lutz's criticism, said that such associations as the Bromeliad insects exhibited no parallel adaptations of structure to justify regarding them as a natural society. The student of plant societies had been able to trace such adaptations in the various members of the societies they had recognized, and became thereby justified in doing so. The bond they had chosen as their principal guide, the moisture of the soil, having failed in beetles, the coleopterist must try others, and may find a satisfactory substitute in food, though it must be admitted that as a bond it will not produce units tied to a particular plant, but rather to the same parts of different plants.

Mr. Weeks expressed some doubt as to the value of such discussions which he said by minute subdivision might be prolonged indefinitely, but suggested that if concentrated on such an economic subject as the enemies of the house fly, might become of some practical value.

Mr. Davis exhibited insects caught on a walk taken by Mr. Engelhardt and himself from Central Park to Massepequa, Long Island, on April 6, espe-

cially the moths *Jodia rufago* and *Copipanolis cubilis* recently emerged but found hiding among dry leaves. He spoke also of the excursion on April 13 to Roselle Park and showed specimens of *Cremastochilus* found there with ants.

Dr. Lutz exhibited F. W. L. Sladen's recent work on the "Humble Bee" and commented on the ingenious plan therein described for studying the nests.

The meeting closed with a discussion of alternating generations in gall insects in which Dr. Lutz, Mr. Davis and Mr. Weeks took part.

MEETING OF MAY 6.

A regular meeting of the New York Entomological Society was held May 6, 1913, at 8.15 o'clock P. M., in the American Museum of Natural History, President Dr. Raymond C. Osburn in the chair, and nineteen members and one visitor present.

The field committee reported a successful meeting on Garret Mountain, with nine members and two visitors participating.

A letter was read inviting the Society to send a delegate to the fiftieth annual meeting of the Entomological Society of Ontario, action upon which was postponed to the following meeting.

A letter from Nathan Banks was read, requesting the Society to select two members to serve on the American National Committee on Nomenclature.

On motion the president was instructed to make the selection and later in the evening announced the names of Messrs. Grossbeck and Leng.

A letter was also read from Dr. Richard E. Kunze, of Phœnix, Ariz., addressed to Mr. Groth, and sending for distribution twenty copies of Dr. Kunze's paper on "Entomological Materia Medica."

The Secretary was instructed to convey to Dr. Kunze the thanks of the members and their congratulations to him upon completing his 75th year.

Mr. Barber presented photographs of Messrs. Jacob Doll and Charles Schaeffer surrounded by entomological material.

Mr. Dow read a paper entitled "The Rector of Barham," in which the work of Kirby and his contemporaries was pleasantly reviewed, and many interesting facts concerning those early entomologists brought to light. On request, Mr. Dow, continuing, spoke of the celebrated entomologists of all lands up to the time of Leconte.

His remarks were discussed by Messrs. Schaeffer, Barber, Davis, Angell, Lutz and the president, and will be printed in Bulletin of the Brooklyn Society.

Mr. Davis read a paper on "A Dragon Fly New to the Local List," exhibiting *Dorocordulia lintneri* Hagen collected some years ago by John A. Grossbeck at Paterson, N. J., on May 4 and later presented to the American Museum of Natural History. This specimen is a female. The type locality is Center, near Albany, N. Y., where the species was collected by Dr. Lintner on May 27, and it has also been reported from Lake Winnipeg, Canada. The species is northern and rare in collections, and it is particularly interesting that it should occur in New Jersey. It is an addition to the local list.

Mr. Davis spoke also of the systematic position of the species and the characters of the genus to which it is at present assigned.

Mr. Mutchler exhibited a specimen of *Carabus vietinghovi* Adams, collected on June 23, 1908, in the Mackenzie River delta by Dr. Anderson.

The president asked for notes on early spring collecting.

Mr. Shoemaker exhibited a moth taken near Massapequa, Long Island, April 6, a freshly emerged specimen of *Feralia major*, which presented a different appearance to ordinary cabinet specimens.

Mr. Woodruff read a paper describing his capture of *Donacia emarginata* in the flowers of *Caltha palustris*, the marsh marigold or cowslip, and finding the cocoons, in which the larvæ had pupated, clustered above the roots of the same plant.

He also pointed out the constant color difference in the sexes.

Mr. Grossbeck spoke of the Garret Rock meeting and its results, indicating that the season has been an early one for Lepidoptera. Thus *Thecla augustus* and *irus*, of which only a few rubbed examples were seen May 4, 1913, were formerly abundant at this season; specimens of *Pergus centaureæ* from 1901 to 1910 were found between April 25 and May 14, and were abundant and in fine condition during the first days of May, but none were seen on May 4 this year; *Anthocharis genutia* in the same way was formerly abundant May 6 and 18 with the ♀♀ appearing later than ♂♂, while this year on May 4 more ♀♀ than ♂♂ were taken.

Mr. Grossbeck added as an additional example of the early season the fact noted by Mr. Eaton in charge of Newark mosquito work, that *Culex cantator* was a week or ten days earlier in the marsh than in 1912.

Mr. Davis mentioned finding a wing of *Parthenos* (*Catocala*) *nubilus* on May 4, as a further evidence of the early season, and *Pamphila metea* as one of the rarer species caught.

Mr. Dow described the condition of a dead hickory five inches in diameter whereof the inner bark was filled with pupæ of *Magdalis barbita?* and the outer bark with freshly emerged imagos, some still whitish in color. The perfect specimens flew away swiftly, but enough were counted to indicate 175 to 200 beetles to each square foot of bark. The Trogositid beetle *Tenebrioides dubius* was found feeding on the pupæ.

Mr. Shoemaker spoke of the moth *Homoptera cingulifera*.

Mr. Davis mentioned Mr. Shoemaker's capture of the spring form of the Luna moth, *Tropheo luna-rubromarginata*.

Mr. Davis also described his visit on April 18 to East Jewett, N. Y., in the Catskill Mountains, showing photographs and some of the specimens caught, including *Ischalia costata*, a rare species of the Pyrochroidæ, which he found resting on the protruding root of a tree.

Mr. Schaeffer said this species was never abundant, he himself having taken only a few specimens in the Black Mountains, N. C., by sifting far down in deep mouldy leaves.

Mr. Davis read extracts from letters received from Colonel Wirt Robinson,

describing the number of species found at West Point in early spring by examining the windrows or washup at the end of the reservoir, and from Charles Dury giving the only record for Ohio of the dragon fly, *Anax longipes*, one specimen seen in Spring Grove Cemetery, but not caught despite two days' endeavor and a permit he said he obtained to shoot it.

Mr. Engelhardt spoke briefly of his experiences at Claremont, N. H., May 1 to 3, where *Feralia major* was found in pine and hemlock groves, and many other species caught by day and at night.

Mr. J. W. Angell exhibited his collection of *Lucanus cervus* and its varieties and called especial attention to a monstrosity in which the tibiæ were double.

Mr. Schaeffer mentioned the various published records of monstrosities, especially the papers by Kraatz, Horn and Jayne.

Dr. Lutz said in breeding *Drosophila* specimens with ten or twelve legs have occurred, but the character has not proven constant.

Mr. Leng exhibited a specimen of *Ceratomegilla ulkei*, a ladybug, caught by Dr. Anderson in the Mackenzie delta, and remarked that the generic character described by Crotch, the dilation of the apex of the second antennal joint was missing, and its existence in the type possibly another instance of deformity, in which case the genus *Ceratomegilla* would become identical with *Megilla*. The structure of the claw is in fact identical with *Megilla*, and the pattern of maculation the same except that the black pigment is more extended in *ulkei*.

Mr. Schaeffer engaged to examine the type when next in Boston.

JOURNAL

OF THE

New York Entomological Society.

VOL. XXI. DECEMBER, 1913. No. 4

A SYNOPSIS OF THE DIPTEROUS GROUPS AGROMYZINÆ, MILICHIINÆ, OCHTHIPHILINÆ AND GEOMYZINÆ.

BY A. L. MELANDER,

PULLMAN, WASHINGTON.

(Continued from p. 273.)

SUBFAMILY GEOMYZINÆ.

TABLE OF THE GENERA.

Middle of face with a pronounced tubercle; anterior fronto-orbital proclinate; calypter entirely devoid of cilia; only the root of the auxiliary vein present, the costal break immediately before the end of the first vein; cheeks comprised largely of the lateral prolongations of the center of the face; mesopleuræ entirely bare. (North America.)
Sinophthalmus Coquillett.

Face not tuberculate; anterior fronto-orbital reclinate; calypteres fringed with cilia; auxiliary vein weak, but usually meeting the costa some distance before the end of the first vein, at which place normally is located the costal break; lateral prolongations of the center of the face narrow; mesopleuræ often setulose or bristly................2.

2. Cheeks narrow, less than one fourth the eye-height, the center of the face broader than the cheeks at the vibrissæ; arista plumose to loosely pubescent, more than one and one half times the length of the antenna, its basal segment long, the third antennal joint with fine but perceptible pubescence, especially along the front edge; upper occiput

usually concave; anal angle of wing usually reduced and without large alula; marginal cell typically long. (OPOMYZINA.)..............3.

Cheeks broad, usually more than one fourth the eye-height, at the vibrissal angle usually broader than the diameter of the central part of the face; arista shorter and sub-bare, the microscopic hairs close together, its basal segment usually short, the third antennal joint without perceptible hairs arising from the spongy pubescence; occiput flattened or convex; anal angle evident and with alula; marginal cell typically not long and narrow. (CHIROMYIINA.)........................20.

3. Dorsocentrals extending in front of the suture; wings pictured.........4.

Presutural dorsocentrals absent or scarcely differentiated..............6.

4. Anal angle of wing evident; wings largely clouded with black but with numerous hyaline spots; oral vibrissæ present; two fronto-orbitals; occiput flat; postverticals large; pleuræ bare; tibiæ with preapical bristle. (North America.)..................*Spilochroa* Williston.

Anal angle reduced; wings hyaline, with some dark spots; no oral vibrissa; one fronto-orbital; occiput concave above; no postverticals; pleuræ hairy, one sternopleural, one mesopleural bristle; no preapical bristle on tibiæ ....5.

5. Middle of cheeks with two stout vibrissæ; no anal angle to wing. (Europe, North America.)..............................*Geomyza* Fallen.

Cheeks with short fine hairs only; anal angle small but evident. (Europe, Australia?, North America?)....................*Opomyza* Fallen.

6. At least the front tibiæ with preapical bristle on the outer side; four scutellar bristles; mesopleuræ hairy.............................7.

Tibiæ without preapical bristle (in *Amphoroneura* the hind tibiæ with a weak preapical bristle); usually the basal scutellar bristles reduced or wanting; mesopleuræ bare; second vein usually extending close to the costa; postverticals usually minute or wanting; costa not spined. 12.

7. Vibrissa present; wings usually pictured............................8.

No oral vibrissæ; wings hyaline; one fronto-orbital; front and hind tibiæ with preapical bristle; arista short-plumose; abdomen slender, the second and third segments with marginal bristles; costa not spinose; anterior cross-vein before the end of the first vein; ultimate section of the fourth vein two thirds the length of the penultimate section; discal cell confluent with the second basal cell. 5 mm. (Java.) *Apsinota* Wulp.

8. Base of fifth vein greatly thickened; one fronto-orbital; front tibiæ only with preapical bristle. (North America.)....*Tauromyia* Giglio-Tos.

Veins not thickened; three fronto-orbitals; postverticals present; all the tibiæ with preapical bristle.....................................9.

9. The three fronto-orbitals in a single row; two acrostichals, the mesonotum densely hairy but the hairs not arranged in rows; discal and second basal cells confluent. (North America.).....*Pseudiastata* Coquillett.

Middle fronto-orbital proclinate and nearer the eye than the others are, but two of the fronto-orbitals of large size; discal cell complete; acrostichals numerous; costa spinulose.........................10.

10. Antennæ more or less projecting, not reaching the oral margin; base of anal vein present, but rudimentary............................11.
Antennæ decumbent, the third joint twice as long as broad, reaching the oral margin; anal vein wanting; foremost fronto-orbital reduced in size; face narrow, its sides parallel; arista pubescent; the second antennal joint tipped with a short projecting bristle. (Europe, North America.)..................................*Tryptochæta* Rondani.
11. Arista plumose, the hairs longer above, third antennal joint one and one half times as long as broad; the second joint tipped with a strong projecting bristle; hindmost fronto-orbital reduced in size; face as broad as either eye, widest at level of the vibrissæ. (Europe, North America.)..................................*Diastata* Meigen.
Arista pubescent; the third antennal joint short, oval; the second joint without projecting bristle; fronto-orbitals of male as in *Diastata*, of female as in *Tryptochæta*. (Europe.)...........*Euthychæta* Loew.
12. Oral vibrissæ not differentiated; eyes reniform, approaching below so as to narrow the face; arista long and loosely plumose; wings more or less pictured; four scutellars.................................13.
Oral vibrissæ present; eyes rounded, face not shield-shaped; arista short-plumose or pubescent; third antennal joint rounded; usually but two strong scutellar bristles.......................................15.
13. Wings fasciate, only the base of the auxiliary vein present, second basal and anal cells relatively large; second antennal joint rather broad, the third joint somewhat pointed.............................14.
Wings nearly hyaline, the broad marginal cell more or less brownish; second basal and anal cells wanting; third and fourth veins converging; second and third sections of the costa equal; third antennal joint broadly oval. (South Asia.) (Tijds. ent., LIV, 423, 1911.)
Amphoroneura deMeijere.
14. Face hollowed out in the middle and elevated into a low ridge on each side and around the lower end; one pair of fronto-orbitals; two vertical, one ocellar and one postvertical. (North America.)
Scutops Coquillett.
Center of face longitudinally convex and slightly raised above the facial orbits; two pairs of fronto-orbitals, forming a transverse row, one vertical, no ocellar, no postverticals. (North America.)
Cyamops new genus.
15. Wings six times as long as broad, the hind margin broadly and strongly excised, leaving the discal cell unusually narrow; occiput convex. (North America.).........................*Mutiloptera* Coquillett.
Wings not unusually narrow, the hind margin not excised; occiput concave; front femora usually with a thorn beneath...............16.
16. Wings pictured, the second vein arching forward close to the costa, the anal angle wanting; two fronto-orbitals; cheeks one tenth the eye-height; ocellar triangle large and shining. (North America.)
Ischnomyia Loew.

Wings hyaline, the second vein parallel with the costa, the anal angle more or less evident..17.

17. Two strong fronto-orbitals, in front of which is a smaller bristle, the hinder fronto-orbital behind the middle of the front; postverticals present; mesonotum more or less pollinose and with acrostichal setulæ; face and cheeks relatively broad. (Europe, North America.) *Anthomyza* Fallen.

One strong fronto-orbital at the middle of the front, with a smaller bristle before; postverticals minute or wanting; disc of mesonotum polished ....18.

18. Front opaque, the ocellar triangle not enlarged....................................19.

Ocellar triangle enlarged, reaching nearly to the antennæ, it and the frontal orbits descending to include the orbital bristle highly polished, thus forming an M-shaped design on the front; arista short-plumose; two strong dorsocentrals; postverticals minute; eyes large, the lower facets enlarged, thus reducing the size of the face and cheeks. (North America.)........................*Mumetopia* new genus.

19. One dorsocentral; face shining black; postverticals minute; arista plumose; wings long and narrow. (Europe.)........*Anagnota* Becker.

Two dorsocentrals; face pruinose; no postverticals; a rounder head, more elevated thorax, shorter and broader wings with the tip less rounded, and shorter claws. (Europe.)...............*Paranthomyza* Czerny.

20. Pubescent, without macrochætæ, scutellum margined with fine bristles, cheeks broad and hairy; front hairy, produced over the antennæ as a subconical process. (Europe.)..............*Selachops* Wahlberg.

Macrochætæ developed; front not produced..........................21.

21. But two postsutural dorsocentrals present; no vibrissæ; the polished front with a broad transverse impression below the middle, and with two fronto-orbitals; no preapical tibial bristles; costa not broken and not spinose. (North America.)................*Pseudodinia* Coquillett.

Dorsocentrals usually extending in front of suture; front neither transversely grooved nor polished; fracture of costa before the end of the first vein usually distinct....................................22.

22. Tibiæ with preapical bristle; costa bristly with short spines; two fronto-orbitals; two presutural dorsocentrals; two or three sternopleurals..23.

Tibiæ without preapical bristle; costa not spinose; vibrissa small or wanting; one sternopleural; one presutural dorsocentral.............24.

23. Black species; vibrissæ large; face vertical, below the epistome with an oral margin; cheeks narrower than the eye-height; antennæ normal; front pollinose. (Europe, Asia, North America.). *Trixoscelis* Rondani.

Yellow species, with yellow bristles; vibrissæ rather small; face receding below, without oral margin; cheeks nearly as broad as the eye-height; antennæ very small. (North America.)..........*Zagonia* Coquillett.

24. Ovipositor lengthened, two times as long as another segment, but above deeply compressed, so that the lateral margins form narrow ridges; anal and second basal cells lacking; two fronto-orbitals; one row only of acrostichals. 1.8 mm. (Europe.).....*Pseudopomyza* Strobl.

Ovipositor not of remarkable structure; anal cell at least present......25.

25. **Acrostichal** setulæ and hairs of front absent or greatly reduced; bristles and hairs black; discal cell usually fused with the second basal; cross-veins rather close together; usually no oral vibrissa; one to three fronto-orbitals; upper occiput rather concave. (Europe, Asia, North America.)................................*Tethina* Haliday.

Acrostichal and frontal hairs present; hairs and bristles often yellow or white; discal cell separated from the second basal; oral vibrissa more or less differentiated..26.

26. Cheeks with a marginal row of hairs; face nearly vertical or projecting; cinereous species; ultimate section of fifth vein usually shorter than the penultimate section of the fourth; three or four fronto-orbitals, outwardly bent. (Europe, North America.).......*Rhicnoessa* Loew.

Cheeks hairy; face receding; ground-color yellow; ultimate section of fifth vein equal to or longer than the penultimate section of the fourth vein ....27.

27. Two or three reclinate fronto-orbitals; center of face small and deeply sunken; upper occiput flattened. (Europe, Africa, North America.) *Aphaniosoma* Becker.

Three fronto-orbitals, the front pair convergent; center of face not deeply impressed; occiput rather convex. (Europe, Asia, North America.) *Chiromyia* Desvoidy.

SINOPHTHALMUS Coquillett.

This genus is aberrant in the Geomyzinæ. It differs from all the other genera of this group before me in having the calypteres entirely without cilia; the auxiliary vein very short, entirely vanishing halfway to the costa, the costal break immediately before the end of the first vein; the costa showing a weak spot beyond the humeral cross-vein corresponding to the first costal break of other subfamilies; the basal cross-vein of the discal cell is interrupted; the lateral prolongations of the center of the face occupy a large part of the cheeks; the mesopleuræ entirely bare; and the face with central protuberance.

The genus is certainly quite similar to *Drosophila repleta* Wollaston, differing indeed only in the family characteristics, such as the separate basal cell and pubescent arista. The two are such replicas of each other, so similar in size, color, vestiture, chætotaxy, and proportions of parts, that it is hard to believe that their similarity is the result of convergence and that they should be assigned to separate subfamilies.

But a single described species.

Stout, mottled with black and yellowish; head yellow, the cheeks, sides of occiput and center of front marked with black; mesonotum centrally cinereous black, with setigerous brown spots; the pleural sutures and base and apex of the scutellum testaceous; abdomen black, except at base and on incisures; femora black except at end, tibiæ with three brown rings; wings hyaline, the cross-veins and a spot on the fourth vein brown. 3.5 mm. Cal.* (Proc. Ent. Soc. Wash., VI, 191, 1904.) *pictus* Coquillett.

SPILOCHROA Williston.

Gray pollinose, head, thorax, antennæ and legs testaceous; abdomen brownish black, irregularly mottled with white pubescence and with sparse black hairs; wings largely infumated, the base and numerous rounded or quadrate spots hyaline (see fig. 3, page 297, Williston's Manual, 3 ed.); ocellar bristles large, distant one third the width of the front; costa with short spines. 2.5 mm. (Fla., W. Ind.*) (*Peratochætus* (*Heterochroa*) *ornatus*.)..........................*ornata* Johnson.

GEOMYZA Fallen.

Wings with apical spot and both cross-veins brown; mesonotum shining red; legs yellow ....2.
Wings with at least the anterior cross-vein not bordered with brown.......3.
2. Legs entirely yellow; metanotum red; female abdomen reddish, with brown bands, male abdomen sometimes reddish at base. 3–4 mm. (Eur.;* U. S., in Hough Coll.).......................*combinata* Linnæus.
Hind femora with more or less evident preapical brown ring; metanotum blackish; abdomen black, of the female reddish at tip. 3 mm. (Alaska, Wash.,* Id.,* Wyom., Cal.*) (*Balioptera*.)....*lurida* Loew.
3. Legs entirely yellow; mesonotum shining red; posterior cross-vein clouded with brown; abdomen of female shining black. 4 mm. (Eur.; Cal.) *venusta* Meigen.
Hind legs largely brown; mesonotum blackish; both cross-veins unclouded; apex of abdomen of female reddish. 3 mm. (Cal.,* Wash.*) *monostigma* new species.

Geomyza monostigma new species.

Female.—Length 3 mm. Largely blackish, shining. Back of head blackish, the anterior half of the front, the face, cheeks, antennæ and mouth testaceous; arista plumose above, pubescent below. Mesonotum blackish, except the humeri and sides; scutellum reddish; metanotum black; pleuræ dark brown, the sutures broadly reddish. Abdomen black, the apex reddish. Legs dull yellowish, the outer half of the hind femora, and a basal and apical broad ring of the hind tibiæ fuscous. Halteres white, the stem black. Wings clear hyaline, the humeral and costal cells blackish; at the tip of the marginal cell, extending across the end of the third vein, is an apical blackish spot; cross-veins not marked with a dark spot.

Two specimens. Stanford University, California, 24 April, 1910 (Wm. M. Mann); Seattle, Washington.

Structurally the species is the same as *combinata* and *lurida*.

OPOMYZA Fallen.

It is not at all certain that the following species described by Walker is a true *Opomyza*. His full description is quoted.

Testaceous, head whitish in front; thorax rather stout; abdomen with a spot on each side near the base, a dorsal spot and the apical half black; legs whitish; wings slightly grayish, with a blackish spot on the costa near the base, and another on the costa at two thirds of the length; discal transverse vein straight, parted by twice its length from the border, and by much more than twice its length from the prebrachial transverse, which is near the base. 3 mm. (U. S.) . . *signicosta* Walker.

TAUROMYIA Giglio-Tos.

The genus *Tauromyia* has been doubtfully located among the Geomyzinæ. Williston believes it can not belong here. Its size, eight millimeters, is greater than that of any other member of the group, but otherwise there is nothing radical in the description to exclude this fly from this subfamily. The head is somewhat hemispherical, the face large and vertical, the cheeks narrow and bare but furnished with long bristles along the margin of the large mouth-opening. One recurved fronto-orbital bristle. Only posterior dorsocentrals present. Wings long, the anal angle wanting, the fifth vein thickened at base.

Testaceous; face with three small black spots; front with two black spots above antennæ and ocellar triangle black; mesonotum with four brown vittæ; abdomen blackish apically, all the segments margined with brown; wings lightly yellowish. 8 mm. (Mex.) . . *pachyneura* Giglio-Tos.

PSEUDIASTATA Coquillett.

Yellow, the abdomen brown; wings hyaline, marked with six brown bands, of which five extend posteriorly from the costa and one covers the posterior cross-vein. 3 mm. (Md.) (Proc. Wash. Ent. Soc., IX, 148, 1907.) . . . . *nebulosa* Coquillett.

TRYPTOCHÆTA Rondani.

Cinereous brown, the front half of the wings lightly infumated; face, cheeks, anterior edge of the front, humeri, legs including coxæ and base and tip of abdomen yellow; mesonotum with four poorly defined darker vittæ alternating with more pollinose grayish stripes. 3 mm. (Wash.*) (Wien. entom. Ztg., XXX, 44, 1911.) . . . . *micans* Hendel.

DIASTATA Meigen.

Hind cross-vein enclosed in a brown mark..............................2.

Wings hyaline, slightly infumated along the costal portion, the costal cell mostly black, the hind cross-vein slightly nearer the end of the fourth vein than the anterior cross-vein. 2.5 mm. (Wash.*) .*modesta* n. sp.

2. Costa and posterior cross-vein infumated; arista two times as long as the third antennal joint..............................3.

Brown markings of wing including the anterior cross-vein, the costa paler than the markings; arista shorter..............................4.

3. Posterior cross-vein considerably nearer the anterior cross-vein than the end of the fourth vein; thorax with four indistinct vittæ. 2.5 mm. (Martin's Falls, Canada.)......................*tenuipes* Walker.

Posterior cross-vein nearer the end of the fourth vein than to the anterior cross-vein; mesonotum not vittate; middle coxæ of male with very long hairs. 4 mm. (Eur.; Asia; N. H., Wash.*)....*vagans* Loew.

4. Wings brown, marked with three fasciæ, the first subbasal, the second between the cross-veins, starting at the second vein and interrupted or not by the discal cell, the third subapical and more or less interrupted at the fourth vein; base of abdomen with pollinose fasciæ. 3 mm. (N. J., Wisc.*)............................*pulchra* Loew.

Wings largely hyaline or subhyaline, marked with blackish spots about the costal cell, the anterior cross-vein, the posterior cross-vein extending to the third vein, and narrowly at the end of the second, third and fourth veins..............................5.

5. Abdomen shining black; on each side of the middle black spot of the wings is a white spot, the basal of which extends from the third to the fifth veins, the outer from the third to the fourth veins. 2–3.5 mm. (Alaska, Wash.,* Id.,* Or.)......................*eluta* Loew.

Basal segments of abdomen fasciate with white pollen; outer white spot of wing not present. 3 mm. (Eur.; N. J., Ohio.)..*nebulosa* Fallen.

Diastata modesta new species.

Female.—Length 2.5 mm. Disc of mesonotum brownish pollinose, the notopleural suture and pleuræ cinereous; abdomen subshining, with uniform thin coating of brownish pollen. Front luteous, the orbits raised as far as the foremost bristle, merging at the minute hindmost frontal bristle with the brown-cinereous color of the occiput. Postvertical bristles large, twice as far apart as the ocellars. Antennæ yellow, the third joint one and one fourth times as long as broad, apically rounded, the black arista loosely plumose, and about two times as long as the joint. Face and cheeks white. Two dorsocentrals, eight rows of acrostichals, three supra-alars, two sternopleurals, mesopleuræ setulose with a row of six upward-directed bristles along the posterior margin. Legs including the coxæ yellow. Wings nearly hyaline, the costal cell black, the costal portion lightly infumated, no fasciæ or spottings; anterior cross-vein located under the end of the first vein, costal spines minute.

A single specimen, taken July 31, 1908, on Mount Constitution, Orcas Island, Washington.

SCUTOPS Coquillett.

Yellow, apices of palpi, two broad vittæ on mesonotum, metanotum except sides, abdomen and two interrupted bands on each tibia, black; polished, the face, orbits and noto-pleural suture pruinose; wings brownish outwardly, with a subapical fascia and the tip whitish. 3 mm. (Nicaragua.) (Proc. Ent. Soc. Wash., VI, 97, 1904.)
fascipennis Coquillett.

CYAMOPS new genus.

Near *Scutops* Coquillett. Head broader than the thorax, the upper occiput concave, the lower occiput convex, the head therefore longest below, but still much higher than long. Eyes reniform, vertical, the lower anterior facets enlarged so as to diminish the size of the face. Sides of front nearly parallel, that part of the front between the ocelli and the antennæ nearly twice as broad as long; two pairs of fronto-orbitals, on nearly a horizontal row, the inner pair reclinate, the outer pair proclinate; no ocellar or postvertical bristles; but one pair (the inner) of vertical bristles present. Face suddenly narrowed beneath the antennæ by the encroaching eyes, which nearly obliterate the facial orbits at the place where they pass into the genæ, the sides of the center of the face, however, vertically subparallel, this portion of the face slightly convex, expanding and rounding below without an oral margin into the large buccal cavity; clypeus (Chitinhufeisen) strongly developed, but retracted into the cavity. Cheeks about one tenth the eye-height, the genæ nearly parallel with the margin of the eye, the buccæ differentiated only as the line bearing the weak oral hairs, the lateral prolongations of the center of the face forming a triangular anterior part of the cheeks, passing into, but separated by a distinct oblique suture, from the unusually developed shining posterior oral margin; vibrissæ no larger than the oral hairs, but porrect.

Chætotaxy of the thorax as follows: one dorsocentral, two rows of fine acrostichals approximate before but diverging behind, two notopleurals, two supra-alars, four scutellars; one sternopleural centrally located, pleuræ otherwise glabrous. Abdomen very sparsely hairy, comprising six flattened segments, broad up to the last segment, which is very short and abruptly and strongly constricted for the attachment of the small genitalia. The hypopygium consisting of two vertically moving valves, from the upper of which arise two short converging

processes. Legs without bristles and with ordinary hairs; the middle tibiæ tipped with a long spur. Calypteres rudimentary, fringed with but four hairs. Wings about two and one half times as long as wide; costa stopping at the fourth vein, weakened but not actually broken some distance before the end of the first vein, the second section of the costa two times as long as the third, which is twice the length of the fourth section; auxiliary vein straight, vanishing halfway between the humeral cross-vein and the end of the first vein; the first vein extending two fifths the length of the wing; third and fourth veins slightly converging, the anterior cross-vein before the middle of the long discal cell, the sections of the fourth vein proportioned about three to four, those of the fifth vein about six to one, the posterior cross-vein longer than the ultimate section of the fifth and one half the length of the penultimate section of the fourth vein; basal cells completely formed and elongate, anal vein extending one half the way to the margin of the wing.

Type species: *Cyamops nebulosa,* new species, following.

Cyamops nebulosa new species.

Male.—Length 2.5 mm. Shining, blackish, the lower part of the front opaque black, with white-pollinose orbits, the face and cheeks whitish-pollinose. Legs including the coxæ yellowish, the outer two thirds of the femora blackish, the tip of the tarsi brown. Halteres with large white knob; calypteres margined with brown. Center of wing with a large brownish cloud, the apex similarly clouded.

One specimen. Woods Hole, Massachusetts. July 7, 1902.

While this insect is markedly different from the other Geomyzinæ, yet it finds its best location here. The only other groups with which it could be confused are the Psilinæ and the Drosophilinæ.

MUTILOPTERA Coquillett.

Yellow, the abdomen black. Wings hyaline, the apex brown, which color extends half way to the posterior cross-vein; cross-veins of equal length, the posterior clouded with brown. 2 mm. (N. Dak.) (Proc. Ent. Soc. Wash., IX, 148, 1907.) .... *apicalis* Coquillett.

ISCHNOMYIA Loew.

With darker spot at end of second vein, all the other veins bordered with brown; upper vibrissæ long; palpi brownish; pleuræ largely blackish; front femora with strong thorn beneath. 3 mm. (Mich.*) (Wien. ent. Ztg., XXX, 45, 1911; Williston, Manual, 3 ed., p. 80, fig. 14.) *spinosa* Hendel

Third vein broadly brown, expanding anteriorly at tip of wing, the root of the wing black, the posterior veins obscurely bordered; both vibrissæ small; palpi whitish; pleuræ whitish, with black border above; front femora beneath with a row of uniform bristles; mesonotum often with two pale stripes. 2.5 mm. (Pa., N. J., Wisc.). *albicosta* Walker.

ANTHOMYZA Fallen.

Head, thorax, abdomen, halteres and legs, except the last tarsal joint, wholly yellow. 2.6 mm. (Eur.; Wash.*)................*pallida* Zetterstedt.

Partly or wholly blackish..2.

2. Pleuræ yellow, largely or wholly; last tarsal joint black................3.

Pleuræ wholly black, lightly cinereous; legs entirely yellow; occiput and thorax black, abdomen brownish; halteres yellow. 2.5 mm. (Eur.; Ont.,* Ill.,* N. Mex.,* Id.,* Wash.*)................*gracilis* Fallen.

3. Mesonotum and scutellum grayish; head, antennæ, humeri, pleuræ, venter, halteres and legs yellow. 2.5 mm. (Alaska, Wash.,* N. H.) *tenuis* Loew.

Largely yellowish; occipital spot, mesonotum with four faint vittæ, pleuræ above and abdomen with fuscous fasciæ, darker. 2.3 mm. (D. C., N. J., Ga., Cal., Wash.*)........................*variegata* Loew.

MUMETOPIA new genus.

Related to *Anthomyza* but differs in the narrower face and cheeks, the reduction of the fronto-orbital bristles, and the specialization of the interfrontalia.

Eyes large, subquadrate, the facets of the lower-front part enlarged so as to reduce the face and cheeks, the face thus at most scarcely more than one half the width of the front at its middle, and the cheeks about one tenth of the eye-height. The uppermost fronto-orbital not behind the middle of the front, at most one small fronto-orbital anterior to this. Ocellar triangle very large, glistening, reaching quite to the frontal suture; frontal orbits differentiated; upper occiput concave; postverticals minute or wanting. Two dorsocentrals; basal scutellars minute; acrostichals greatly reduced; two sternopleurals. Front femora with thorn beneath and with usual bristles; no preapicals; ungues small. Wings narrow, three times as long as wide, the anal angle not pronounced.

The pubescence of the arista is pronounced so as to be almost short-plumose. The body is polished, almost devoid of a pollinose coating.

Type: *Mumetopia occipitalis* new species.

KEY TO THE SPECIES OF MUMETOPIA.

Front tibiæ and first three joints of front tarsi black; face less than one fourth as broad as the front at its middle. 1.2 mm. (Porto Rico.) (*Anthomyza.*) ....*nigrimana* Coquillett.

Legs yellow, at most the last tarsal joint black; face about one half as broad as the front at its middle..2.

2. Occiput with a white-pruinose spot above the neck; sides of mesonotum thinly white pruinose; pleuræ largely yellow; last tarsal joint not black; face white; mouth-parts yellow. 1.75 mm. (Ga.,* La.,* Tex.*) *occipitalis* new species.

Occiput, notum, pleuræ and abdomen entirely polished black; last tarsal joint black, contrasting with the remainder of the legs............3.

3. Clypeus, palpi and base of proboscis black; center of face dusky; third antennal joint infuscated above. 2.5 mm. (Mass.*).*nitens* new species.

Mouth-parts entirely yellow; face white; third antennal joint white. 2 mm. (N. H.) (*Anthomyza.*)....................*terminalis* Loew.

Mumetopia occipitalis new species.

Length 1.75 mm. Front black, next to the antennæ yellowish, which becomes whitish pollinose and broader on the orbits; face and cheeks white; occiput black except along the oral margin, marked with a silvery white pruinose spot just above the neck. Antennæ yellow, the third joint mostly white and white-hairy, infuscated only at the insertion of the long-pubescent black arista. Mouth-parts, including the small clypeus, yellow. Width of face one half the width of the front at its middle. A single pronounced fronto-orbital located beyond the middle of the front, with sometimes a minute bristle immediately before it. Mesonotum and abdomen shining, though very little dusted, black, the sides of the mesonotum yellowish overlaid with white pruinosity; pleuræ yellow, but with a horizontal blackish line just below the notopleural suture; two dorsocentrals, acrostichals almost entirely wanting. Halteres and legs light yellow. Wings narrow, hyaline, the veins yellow.

Seven specimens: Austin, Texas (February to November), and Opelousas, Louisiana (March). Those from the latter place were received from Dr. Hough determined as *terminalis* Loew.

Mumetopia nitens new species.

Length 2.5 mm. Shining black, the front above the antennæ, facial orbits, labella, halteres, and the legs, except the last tarsal joint, light yellow. The narrow buccæ continuing as the facialia nearly to the antennæ black; the center of the face dusky; the large clypeus and the palpi black. Antennæ yellow, the third joint dusky above; the black arista with rather long pubescence. The width of the face at its middle somewhat more than one half the width of the middle of the front. Near the middle of the front is a stout fronto-orbital, and towards the level of the antennæ is another, about one half the length of the former. Two dorsocentrals and four rows of fine but distinct

acrostichals. Front femora with a pronounced thorn. Wings hyaline, veins yellow.

Three specimens, Woods Hole, Massachusetts, July 16, 1902.

This species differs from *occipitalis* in the shape of the face, position of the fronto-orbitals, structure of the mouth, as well as in color and size. It can hardly be Loew's *terminalis*.

PSEUDODINIA Coquillett.

Front below the ocelli broader than long; apices of third and fourth veins diverging; black, the proboscis, halteres, tarsi and apices of the tibiæ yellow, the thorax thinly gray pruinose. 1.5 mm. (N. Mex.)
varipes Coquillett.

Front below the ocelli square; third and fourth veins not diverging; black, the proboscis, halteres, tarsi and apices of the tibiæ yellow............2.

2. Occiput, notum, first three segments of the abdomen, and the femora cinereous pruinose, the front femora with stout bristles. 2 mm. (Tex.*)
pruinosa new species.

Head, mesonotum, scutellum and abdomen polished black, only the notopleural suture pruinose; femora shining black, not bristly. 2 mm. (Id.*)....................................*nitida* new species.

Pseudodinia pruinosa new species.

Male.—Length 2 mm. Black, the proboscis, end of tibiæ and the tarsi yellow, the halteres white. Front polished black, with a broad, shallow, transverse depression above the antennæ, that part of the front between the antennæ and the ocelli square, bearing two small reclinate fronto-orbitals; ocellar bristles small and distant, postverticals small and decussate. Face, cheeks and occiput cinereous-black; no vibrissæ; cheeks one sixth the eye-height. Two dorsocentrals placed well back toward the scutellum, about eight irregular rows of minute acrostichals; entire thorax cinereous pruinose. First three segments of the abdomen lightly cinereous pruinose, the remaining segments polished black. Legs rather short and robust, the femora and base of tibiæ cinereous, front femora bristly, middle tibiæ with apical spur. Calypteres white, with rudimentary fringe. Wings hyaline, veins yellowish, the auxiliary vein distinctly separated from the first throughout its entire course though approaching it before the end, the first vein there bent so as to end near the middle of the wing; costa unbroken; third vein ending near the tip of the wing; the sections of the fourth vein proportioned one to two, of the fifth vein three to one.

One specimen, Austin, Texas, May 11, 1900.

Pseudodinia nitida new species.

Female.—Length 2 mm. Slender, shining black, the proboscis, end of the tibiæ, the tarsi and the very narrow pleural sutures testaceous; halteres and

calypteres white. Front shining, the transverse impression above the antennæ shallow and provided with scattered proclinate hairs, that part of the front before the ocelli nearly square; ocellar bristles small, postverticals cruciate, two reclinate fronto-orbital bristles, the anterior at the middle of the front; ocellar triangle and orbits polished, the M-shaped mark between somewhat sericeous; face short, greatly receding, carinate only between the antennæ, facial grooves broad and shallow, cheeks almost bare and about one seventh the eye-height. Mesonotum almost devoid of dust, highly polished, the humeri and the notopleural suture lightly gray-pruinose; two dorsocentrals, acrostichals rather sparse, fine and irregular; pleuræ very lightly pruinose, one mesopleural and two sternopleural bristles, no prothoracic, no setulæ. Abdomen highly polished, but the basal three segments show very sparse pollen, the last segment short and compressed. Legs short, the femora not robust, bristles of front femora fine, no tibial bristles, but the middle tibiæ with a small apical spur. Wings narrow, hyaline, whitish at base, veins becoming light brown apically; the auxiliary vein almost touching the first vein before its end, the first vein continuing straight and ending in the costa much before the middle of the wing, the costa, however, unbroken; third vein ending a little before the wing-tip; penultimate section of the fourth vein less than one half as long as the ultimate section; the sections of the fifth vein proportioned about three to one.

One specimen, Avon, Idaho, July 26, 1912.

TRIXOSCELIS Rondani.

Mesonotum whitish gray, with two indistinct brown vittæ; costal margin of wing between the first and second veins brown; four dorsocentrals; legs yellow, the coxæ and front legs dark brown; antennæ brown. 1.5 mm. (Galapagos Isl., Ariz.) (*?canescens* Loew, Eur.) (*Parodinia: Rhicnoëssa.*) .... *costalis* Coquillett.

Mesonotum cinereous; wings hyaline, the costa not bordered with brown; five dorsocentrals .... 2.

2\. Antennæ entirely yellow, the third joint at most infuscated.............. 3.

Third joint of antennæ black; legs yellow, the tarsi brownish. 2 mm. (Cal.) (*Parodinia.*)............................ *cinerea* Coquillett.

3\. Front legs, except the white coxæ, black, the posterior legs yellow; pollen of upper edge of mesopleuræ slightly brownish. 2.5 mm. (Eur.; Id.,* Wash.,* Cal.,* B. C.*)........................ *frontalis* Fallen.

At least the tibiæ and tarsi yellowish, or the front legs not darker than the others; thorax uniformly cinereous pollinose.................... 4.

4\. Legs entirely yellowish, including the coxæ; face yellowish. 2.5 mm. (Cal.,* Wash.*) (Wien, ent. Ztg., XXX, 43, 1911.).......... *prima* Hendel.

Coxæ and femora blackish, the tibiæ a little infuscated; center of face dusky. 2 mm. (Cal.) (Trans. Am. Ent. Soc., XXXIV, 100, 1908, *Siligo.*) .... *litorea* Aldrich.

ZAGONIA Coquillett.

Entirely yellow, including the hairs and bristles, except that those of the costa, the spurs at the end of each tarsal joint, the claws and sometimes the palpi are black; female with the third joint of the antennæ black, male with the antennæ entirely yellow 2.8 mm. (Cal., Or., Wash.*) (Invert. Pacif., 27, 1904. Syn.: *Siligo oregona* Aldrich, Trans. Am. Ent. Soc., XXXIV, 99, 1908.) .... *flava* Coquillett.

TETHINA Haliday.

Vibrissal angle projecting; face one half as long as the front; three fronto-orbitals; gray-black, the front anteriorly and the face yellow. 3 mm. (Pender Island, B. C., not Idaho; Wash.) (Wien. ent. Ztg., XXX, 41, 1911.) .... *rostrata* Hendel.

Face vertical without projecting vibrissal angle; face more than one half as long as the front...2.

2. Two small fronto-orbitals; the cheeks, face and anterior portion of the front whitish yellow, the light color of the front gradually merging with the brownish vertex..3.

One large fronto-orbital; front coxæ pruinose and white, remainder of legs black; center of front orange, sharply delimited from the brown vertical triangle. 2.5 mm. (Ga., La.,* Cal.,* Wash.,* Alaska.) (*Pelomyia occidentalis* Williston.) (*Rhicnoëssa.*).........*coronata* Loew.

3. Largely olivaceous black, including all the coxæ, femora and tibiæ; tarsi black apically; antennæ mostly black. 2 mm. (Mass., R. I., Cal., Wash.,* Id.,* Alaska.) (*Rhicnoëssa.*)................*parvula* Loew.

Cinereous; legs yellow, only the femora in part cinereous and the last tarsal joint blackish; antennæ mostly yellow. 1.5 mm. (Tex.*) *maritima* new species.

Tethina maritima new species.

Female.—Length 1.5 mm. Yellowish-cinereous, bristles black. Occiput and ocellar triangle yellow-cinereous, front yellow, face and cheeks white. Antennæ yellowish brown, a little darker above, the arista pale. Mouth-parts yellow, the small clypeus black. One or two pairs of minute fronto-orbitals; ocellar bristles widely distant from each other; no postverticals. Thorax and abdomen densely yellow-cinereous pollinose, the last abdominal segment yellowish; four dorsocentrals, one presutural, one sternopleural, one mesopleural bristle. Legs including the coxæ yellow, the femora broadly diffused with the body-color, the last tarsal joint brown. Halteres yellow. Wings faintly yellowish and faintly opalescent; the penultimate section of the fourth vein two thirds as long as the ultimate section of the fifth vein.

Three specimens, Galveston, Texas, taken during the early part of June, 1900.

RHICNOESSA Loew.

Cheeks broad, fully two thirds as wide as the eye-height, the eyes relatively small and horizontally oval ....2.

Cheeks narrow, much less than one half as wide as the eye-height, the eyes relatively larger; hairs and bristles black ....4.

2. Hairs and bristles of entire body and of the legs white; white-cinereous; the cheeks, face and front whitish in ground-color and not cinereous; the femora dusky and last tarsal joint black. 2.5 mm. (Mass., R. I., N. J.,* Tex.*) ....*albula* Loew.

Hairs and bristles of the thorax black; cinereous black species ....3.

3. Hairs of abdomen white; front relatively broad; mesonotal pollen somewhat yellowish; legs yellow, the last tarsal joint and the apex of the femora darkened; third section of the costa only a little longer than the fourth section; penultimate section of the fourth vein a little longer than the ultimate section of the fifth vein. 2.5 mm. (West Ind.) (*Anthomyza cinerea* Williston, 1896, nec *Rhicnoëssa cinerea* Loew, 1862, from Europe, Asia and Africa.) .....*willistoni* new name.

Hairs of abdomen black; front relatively narrow; thorax and abdomen cinereous; femora cinereous black, the tibiæ and last tarsal joint dark; third section of the costa much longer than the fourth; penultimate section of the fourth vein shorter than the ultimate section of the fifth. 1.75 mm. (Mass.*) ....*whitmani* new species.

4. Front narrow, red, with brownish orbits becoming white next to the eyes; antennæ yellow; legs yellow, the last tarsal joint brown. 2–2.5 mm. (West Ind.) (*Anthomyza.*) ....*xanthopoda* Williston.

Front broad, dull brownish; antennæ blackish; femora and tibiæ black; eyes vertically but obliquely oval. 2 mm. (Wash.*) *milichioides* new species.

Rhicnoëssa whitmani new species.

Male.—Length 1.75 mm. Cinereous black, including the occiput, vertex, coxæ and femora. Front testaceous, the orbits whitish, the sides of the front slightly rounding to narrow the front below, the lowermost (fourth) fronto-orbital minute, four pairs of interfrontal bristles, postverticals convergent. Face and cheeks white, the latter two thirds as broad as the height of the horizontally oval eyes; the distance from the mouth to the root of the antennæ about one half the length of the front and vertex; oral margin with a single row of five black bristles, the foremost porrect but not otherwise differentiated as a vibrissa. Antennæ small, reddish, the outer joint a little dusky at its end, the short arista black. Proboscis dark at the base, the labella yellow; palpi yellow. Thoracic bristles rather strong, four dorsocentrals, acrostichals in four rows, lateral setulæ strong; one sternopleural, one superior mesopleural, a vertical row of four bristles along the posterior edge of the mesopleuræ. Abdomen cinereous, not at all reddish, the hind margin of the posterior segments narrowly whitish, its bristles black; hypopygium small, concolorous. Coxæ and femora cinereous black, the tibiæ blackish, the tarsi except the apical

joints yellow. Halteres and calypteres whitish. Wings slender, hyaline, the veins rather dark; fourth section of the costa two thirds as long as the third section; penultimate section of the fourth vein three fourths as long as the ultimate section of the fifth, and twice as long as the posterior cross-vein; basal cells distinct, anal vein represented only bv a fold.

One specimen, Woods Hole, Massachusetts, July, 1902.

I name this species in memory of Professor Charles Otis Whitman, whose name will ever be associated with the locality where the type was found.

Rhicnoëssa milichioides new species.

Male.—Length 2 mm. Black, densely covered with cinereous pollen; cheeks, face, except the epistome, and front testaceous. Antennæ piceous; the arista scarcely longer than the third joint. Proboscis long, slender, chitinized, geniculate, dark in color, the yellow slender labella as long as the middle section of the clyeus; palpi yellow, linear. Front as broad as either eye, its orbits rounding so that at the antennæ the eyes are one third closer together than they are at the level of the front ocellus; two rows of small frontal bristles, the inner row with six bristles, directed inward, the outer row with four reclinate bristles directed rather outward; the center of the front with four pairs of cruciate bristles between which there is a shallow depression; ocellar bristles proclinate, diverging and midway between the ocelli; postverticals convergent. Face deeply excavated, short, the distance from the mouth to the root of the antennæ about one third the length of the front and vertex; epistome projecting almost tuberculate below the antennæ; cheeks one third the eye-height, anteriorly projecting, with a single row of marginal bristles and with a single porrect vibrissa. Bristles and setulæ black; four dorsocentrals, acrostichal and other setulæ strong, one sternopleural, two posterior and one superior mesopleurals, two prothoracic, pleuræ loosely setulose. Six abdominal segments cinereous pruinose, the seventh segment more or less polished black and rounded. Coxæ, femora and tibiæ concolorous with the body, the tarsi, except the last joint, yellowish; bristles of front femora rather strong; middle tibiæ with strong terminal spur; pulvilli large, white. Halteres whitish. Wings nearly hyaline, with yellowish tinge; the penultimate section of the fourth vein slightly longer than the ultimate section of the fifth; costa not at all weakened at the humeral cross-vein, but broken just before the end of the first vein; basal cells distinct, anal vein entirely wanting.

Three specimens, taken on the sea beach at Alki Point, Seattle, Washington, August 2, 1908.

While this species is clearly a *Rhicnoëssa*, it bears a strong resemblance in the shape of its head to certain Milichiine genera. The narrowed front with central depression, the numerous fronto-orbitals, the short, carinate face, the lengthened proboscis and the nearly hori-

zontal and projecting oral margin remind one of the description of *Platophrymyia*. In that genus, however, the disc of the mesonotum is not bristly.

APHANIOSOMA Becker.

A minute yellow species from the Bahamas was sent me by C. W. Johnson, with the label *Cacoxenus*. As the specimen is defective, lacking the wings, it can not be fully determined, but it is apparently very closely related to the type-species, *approximatum*, from Egypt, which was described by Becker in the conclusion of the Aegyptische Dipteren, page 187 (1903).

CHIROMYIA Desvoidy.

Entirely yellow, including the antennæ, legs, halteres, hairs and bristles, and the veins of the wings, only the small ocellar triangle black; eyes circular; about six irregular rows of dorsocentrals; scutellum with a few setulæ in addition to the regular bristles; mesopleuræ setulose. 2–3 mm. (Eur.; Afr.; N. Y., Mass., N. J., N. H., Ga., La.,* Cal.,* Wash.*) (*Scyphella.*) .... *flava* Linnæus.

Same in color, but the ocellar triangle brown; eyes horizontally oval; about four rows of acrostichals; scutellum and mesopleuræ not setulose. 1.5 mm. (Eur.;* Wash.,* Cal.*) .... *minima* Becker.

EXPLANATION OF PLATE VIII.

Fig. 1. Wing of *Leucopis griseola* Fallen, Ochthiphilinæ. Costa unbroken, auxiliary vein largely separate from the first vein.

Fig. 2. Wing of *Meoneura vagans* Fallen, Milichiinæ. Costa broken beyond humeral cross-vein and before the end of the first vein. Auxiliary vein and anal vein rudimentary.

Fig. 3. Wing of *Trixoscelis frontalis* Fallen, Geomyzinæ. Costa interrupted at first vein only.

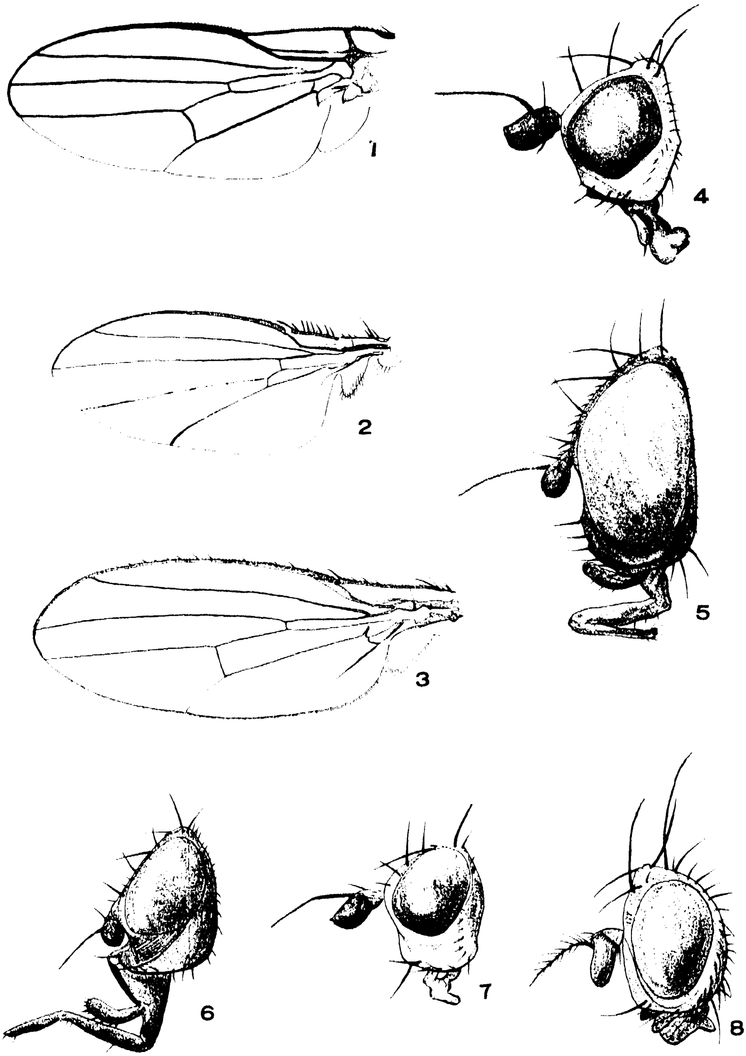
Fig. 4. Head of *Ochthiphila polystigma* Meigen, Ochthiphilinæ.

Fig. 5. Head of *Pholeomyia indecora* Loew, Milichiinæ.

Fig. 6. Head of *Madiza halteralis* Coquillett, Milichiinæ. Lower occiput extending obliquely forward, the bucca small and comprising the vibrissal angle.

Fig. 7. Head of *Cerodonta femoralis* Meigen, Agromyzinæ. Gena narrower than bucca.

Fig. 8. Head of *Diastata eluta* Loew, Geomyzinæ. Bucca narrower than gena.



North American Diptera.

NOTES ON EXORISTIDÆ (TACHINIDÆ AUCTT.) AND ALLIES.

By CHARLES H. T. TOWNSEND,

LIMA, PERU.

The writer has observed with much satisfaction the advent of several new North American workers in this field within the past five years, and trusts not only that their number will be trebled or quadrupled within the next five years, but that all of these new students will publish conscientious descriptions of as many new forms as it may be possible for them to find among these flies. Notwithstanding the numerous forms already described, there is a host of genera and species still awaiting characterization. If the student is so fortunate as to be a competent artist himself, he should present drawings of the new forms characterized. Mr. W. R. Walton's work in this respect is much to be commended His plates are models of accuracy and constitute the first thoroughly competent drawings of Muscoidea to appear for almost a quarter of a century—since the eleven quarto plates by Brauer & von Bergenstamm published in 1889, with which they compare very favorably (except that the proboscis and palpi should always be drawn with the head if they are sufficiently exserted in the original). Students of Muscoidea who can produce drawings of this class are much to be desired, for it must be recognized that no drawings in this superfamily can approach accuracy unless made by a specialist in the group. The drawings made by Dr. Williston five years ago for the third edition of his "Manual" are excellent and deserve much credit, but they are unfortunately too much reduced and in consequence do not always show details accurately. Enlarged photographs properly made will be found extremely serviceable, but so far competent drawings are found to show details far better. It may be possible in the future to develop insect photography sufficiently to show all external muscoid characters clearly, but until that day arrives drawings must take first place.

Aside from drawings, descriptions need to be carefully made, not omitting from generic or specific diagnoses mention of any characters that may help to place the form in hand. Cases to be noted are omission of ocellar bristles present or absent, comparative length of an-

tennal joints in the sexes, scutellar bristles, larvipositor sharply pointed at tip or not, from description of *Eutrixoides* Walton (Ent. News, Vol. XXIV, pp. 50–51); measurement of *Chætophleps crassinervis* Walton (*l. c.*, pp. 51–52); and color and form of palpi from description of *Cryptomeigenia aurifacies* Walton (Proc. E. S. Wash., Vol. XIV, p. 199). Mr. Walton points out that the best view of the thoracic vittæ may be obtained from the rear at an angle of about 45°, but he overlooks the fact that there are often present an extra pair of median vittæ or an unpaired median vitta behind suture only visible from in front.

Mr. Walton states in the last cited article that *Cryptomeigenia theutis* and *Eutrixa exile* are the only species up to that time recorded as parasitic on adults of *Lachnosterna*. He overlooks the record of *Viviania lachnosternæ* (Towns., Tax. Musc. Flies, p. 106). It would seem more probable that this species came from an adult carabid inadvertently introduced into the cage with the Lachnosternas, but the possibility of the Lachnosterna record being correct must not be lost sight of.

Another point to be mentioned in connection with *Cryptomeigenia* is that two distinct forms appear to be confused under this generic name. *C. aurifacies* Walton appears to be *Emphanopteryx* Towns. on the character of the acutely pointed and exserted ovipositor. In Ann. E. S. Am., Vol. IV, pp. 140 and 329, the piercer-like organ of *Emphanopteryx* female is mentioned. The writer's only reason for claiming the absence of this organ in the female of *Cryptomeigenia* is based on a dissection and mount carefully made by Mr. W. R. Thompson at the Gipsy Moth Laboratory, June 11 to 16, 1909. A female of *C. theutis*, determined by Coquillett, was relaxed, abdomen soaked up and "found to contain a coiled uterus with flattened Tachina-like eggs showing maggots with mouth-hooks" (Thompson). The hypopygium of this specimen was removed, cleared and mounted in balsam on two slides, with resulting record of "no piercer such as is present in *Emphanopteryx eumyothyroides* T. is visible" (Thompson). This specimen is TD1828. Female of *Emph. eumyothyroides* (det. Towns.) was present for comparison and possessed the same acute exserted ovipositor figured by Walton for his *C. aurifacies*.

It may be noted here that *Emphanopteryx* doubtless deposits incubated eggs containing the more or less fully formed maggot, and prob-

ably these are deposited inside the adult scarabæid host. *Eutrixoides* quite certainly deposits maggots, probably inserting them inside the host. *Cryptomeigenia* and *Emphanopteryx* belong to the subtribe Meigeniina of the family Exoristidæ. *Eutrixoides* quite certainly belongs to the family Megaprosopidæ, and so does *Eutrixa* in all probability. The last may need to be dissected to make sure of this. The Megaprosopidæ deposit elongate maggots developed in utero from elongate subcylindrical thin-chorion eggs, while the Meigeniina deposit thick-chorion flat-oval eggs incubated in utero. The two groups are thus very distinctly removed from each other, though the general habitus of the flies outside of the head characters may be similar.

Mr. Walton's *Chætophleps crassinervis* may quite possibly be a female *Lixophaga* Towns. There are no characters in the description of the two forms to hinder this conclusion. Such differences as are apparent may easily be sexual. *Chætophleps* female possesses piercer, ventral carina and spinulæ.

Mr. W. R. Thompson has done some most excellent work on these flies, and it is to be hoped that he will continue his publication of both taxonomic and biologic results. His correction of the writer's sex-determination of *Acronarista* is accepted herewith (Can. Ent., Vol. XLIII, p. 313).

Mr. John D. Tothill has begun a series of papers on these groups in Can. Ent., Vol. XLIV, pp. 1–5. His descriptions are well drawn, but his adoption of Coquillett's synonymy under *Tachinophyto* has led him into error. *Lixophaga* is certainly a distinct genus from *Tachinophyto,* and *Methypostena* is also certainly distinct. If the characters of discal abdominal macrochætæ, scutellar bristles, ciliate facialia, cheek width, parafacial width, length of second antennal joint, etc., are all found to be variable within the same sex, then *Pseudomyothyria* may be the same as *Tachinophyto.* That such variability can occur is practically impossible. The following table will show the distinctions:

1. No discal abdominal macrochætæ in either sex........................2.
   Discal abdominal macrochætæ present in both sexes....................3.
2. No orbital bristles in male (parasitic on Rhynchophora).......LIXOPHAGA.
   Orbital bristles in both sexes, facialia not ciliate more than about one third way up, parafacials moderately wide, cheeks about one fourth eye-height, scutellum with strong decussate apical pair of bristles reaching base of third abdominal segment and two shorter lateral pairs,

second antennal joint elongate, arista thickened on basal one fourth, strong costal spine, etc. (Parasitic on tineid larvæ.)..TACHINOPHYTO.

3. Apical cell ending in exact wingtip, no bristles on third vein, wings elongate and narrow, facialia not ciliate half way up, first vein ends opposite small cross-vein. (Parasitic on Chrysomelidæ.)......METHYPOSTENA.

Apical cell ending distinctly before wingtip, third vein bristly at base, wings short, facialia ciliate nearly to base of third antennal joint, parafacials narrow, cheeks about one sixth eye-height, scutellum with short apical pair of bristles and three strong lateral pairs, second antennal joint hardly elongate, arista thickened on basal one half, costal spine weak, first vein ends well beyond small cross-vein, orbital bristles present in both sexes. (Parasitic in lepidopterous and tenthredinid larvæ.) ....................................PSEUDOMYOTHYRIA.

Lixophaga and *Methypostena* are parasitic in the larvæ of the host, normally issuing therefrom but exceptionally wintering over therein and issuing from the adult beetle. *Methypostena* may also be parasitic on Coccinellidæ. The European *Erynnia* has the same host habit as *Methypostena.*

Mr. Tothill's study and comparison of *Senotainia* with *Trixoclista* indicates the distinctness of latter genus from *Amobia* on the character of the presence of a piercer in the female. *Trixoclista* probably deposits maggots.

One more paper remains to be noted here—that by Mr. Harrison E. Smith in Proc. E. S. Wash., Vol. XIV, pp. 118–127. His key of North American species of *Hyperecteina* is useful, but the species are not congeneric. The form *demylus* Wlk. is evidently a compsilurine fly, and *hylotomæ* Coq. is probably a member of the same group; *setigera* is probably a genus novum; *pergandei* is *Admontia,* and so probably is *degeerioides; limata* is *Neadmontia,* and *polita* is perhaps referable there; *retiniæ* may be an *Actia;* while *nasoni, unispinosa* and *tarsalis* are doubtful. On pp. 164–165 of the same volume, the writer referred to some of these points.

Regarding *Hyperecteina* and *Admontia,* the type of the former genus is *metopina* Sch. and that of the latter is *amica* Meig., as stated by Mr. Smith, but these two species are not as yet known to be congeneric. Until such time as this supposition is proved, it is preferable to retain the genera of which they are the types and thus avoid a possible multiplication of nomenclatural changes.

Mr. Smith's *Phorocera einaris* female from Tampico, Mexico, is probably not conspecific with his New England specimens.

Practically all of the work reviewed above is constructive, and as such it is to be commended and emulated. The descriptions show careful preparation and that attention to details which is so essential to taxonomic treatment of these flies. Contrasted with this work is that performed by the late Mr. Coquillett, which was destructive to the extent that it attempted to sink into the synonymy valid generic and specific names. The synonymy indicated in his "Revision" and "Type Species" very largely remains to be verified, while it is safe to say that a very considerable part of it is absolutely unjustifiable. Furthermore, whenever it was possible so to manipulate type designations as to sink genera, he has not neglected the opportunity. Such work is a pulling down which leaves us worse off than before.

What is needed in the Muscoidea, and especially in the Exoristidæ and more nearly allied families, is an intensive study of the numerous forms thoroughly and conscientiously carried through, without bias and with that keen judgment of character values and natural appreciation of phylogenetic relations which stamp the master zoölogist. Each one of us must strive as best he can to attain this result.

NOTES ON THE FEEDING AND REARING OF THE MIDGE, CHIRONOMUS CAYUGÆ JOHANNSEN.

BY MARY RUTH TILBURY,

ITHACA, N. Y.

During a brief opportunity for study in the Limnological Research Laboratory at Cornell University, at the suggestion of Professor James G. Needham, I undertook the problem of feeding bloodworms on a known food. Pure cultures were obtained and placed in sterilized media and kept under constant control. The larvæ, hatched from eggs, grew rapidly, pupated, and emerged in adult form in a little over a month's time. The details of the experiments are noted in the following paragraphs.

On April 28 a mass of eggs was collected with algæ in a pond at the field station near Cayuga Lake, Ithaca, New York. It was a rounded, pear-shaped mass of gelatine 2.5 by 6 millimeters in size,

with the eggs arranged in quite distinct rows about the center, some showing the elongated shape of the egg in side view and others pointing toward the center of the mass. Near the edge of the mass the eggs appeared more crowded and the row-arrangement was less distinct (figure *e*). The eggs themselves are oblong, slightly flattened on one side. When collected they showed the little white embryo well developed and nearly surrounding the brownish yolk which is located on the flattened side of the egg.

The eggs were placed in water in a watchglass and, on April 30, the little embryos were hatching out and moving about in the gelatine. On April 31 they all except one or two had left the gelatine and were walking about freely over the bottom of the watchglass. They measured .7 mm. in length and there were about two hundred of them.

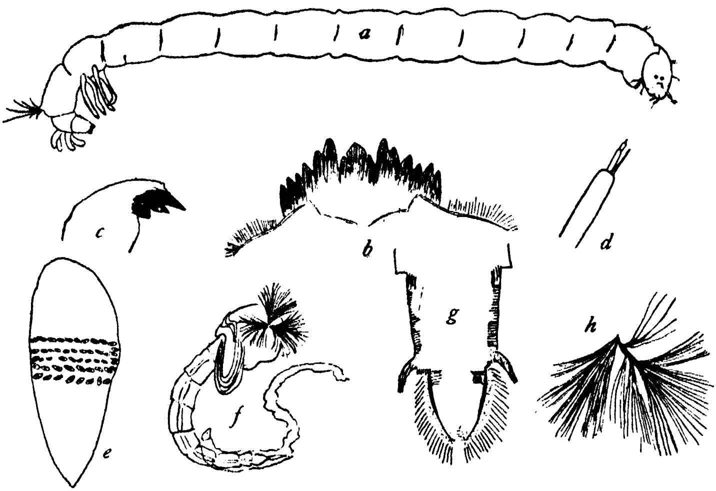
The larvæ were raised in jelly glasses where they could be controlled. Mud and dead leaves from the bottom of a pond where chironomid larvæ lived were boiled to kill all the larvæ that might be present and then, when cooled, put one fourth inch deep in the bottom of the glass and covered with one inch of water. A small piece of cheese cloth was also put in for the larvæ to crawl upon. Then the tiny larvæ were transferred to these glasses, April 31, and were fed every other day with pond weed, mainly *Potamogcton crispus,* which had been ground up by scraping it on the side of a file. This was the only food supplied them.

Little as they were, they began immediately to make cases of silk and sediment about themselves. They stay in their cases most of the time, reaching out and weaving about in the water when they wish to feed, with only the caudal end of the larva remaining within the case, sometimes coming out of one end and sometimes the other end of the tube. If disturbed, they retreat quickly into the tube.

They grew rapidly, beginning to show the red color May 6, and twist about in the water. May 12 they measured 5 mm. in length; May 21, 10 mm., and May 30, 11 mm. The largest one was 12 mm. The cases of the large larvæ were very long, many extending upward from the bottom, so the opening nearly reached the surface of the water. They were made mainly of silk and were so thin that the larvæ within could be plainly seen.

The larval period is about one month. May 31 one pupated, and another June 2, but both died. June 6 another pupated and emerged as an adult male June 7. Others continued to emerge until June 25.

The grown larva is blood red in color and 11 to 12 millimeters in length. The antenna is short, consisting of one main segment two thirds of the whole length, bearing two other parts, one slender and unsegmented, and the other divided into three unequal segments (fig. *d*). The eye consists of two distinct spots on the side of the head. The larva is free from setæ except six microscopic ones on the top of the head and two on the thorax. The mandible is rather large,



(*a*) Lateral view of larvæ showing two kinds of blood gills. (*b*) Border of labium of larva. (*c*) Larval mandible. (*d*) Larval antenna. (*e*) Egg mass (details, in part, omitted.) (*f*) Pupa not wholly withdrawn from the old larval skin. (*g*) Caudal end of pupa showing tail fin and lateral spine. (*h*) One of the three thoracic gill tufts.

with three prominent black teeth (fig. *c*). The labium has a blackened edge with a three-lobed tooth in the middle and a pair of closely united teeth longer than the middle one, together with four other shorter teeth on each side (fig. *b*). On either side and a little below the labium is a prominent row of setæ. The anal blood gills on the eleventh segment are present and those on the twelfth segment are rather long and rounded (fig. *a*).

The pupa is blood red at first, like the larva, but soon takes on the brownish color of the adult. The respiratory organ consists of a cluster of three beautiful white plumes located on each side back of

the head and composed of finely divided filaments (figs. *f* and *h*). The pupa is not very active and lies much of the time on its side at the bottom of the glass with the abdomen bent under until the caudal fin touches the head and occasionally it moves the abdomen rapidly back and forth, causing the caudal fin to beat against the respiratory plumes as if to create currents of water over them. The lateral margins of all the segments of the abdomen, except the first, have two brown dashes. There is a prominent dark spur on the posterior lateral margin of the eighth abdominal segment which ends in three slender teeth (fig. *g*). The anal appendage has an inner dark margin and an outer fringe of rather long hairs. The length is about 9 mm.

The adult which bears a close resemblance to both *C. decorus* and *C. dorsalis* has heretofore in American collections been confused with the latter species from which it differs in the form of the egg mass, in the character of the labium of the larva, and in the hypopygium of the adult. It may be distinguished from *C. decorus* by the form of the labium of the larva and by the coloring of the adult.

The following description of the imago has been furnished for publication here by Dr. O. A. Johannsen.

C. cayugæ new species.

Male.—Length 6–6½ mm. Head and frontal tubercles pale yellow, palpi and antennæ including the large basal joints fuscous. Antennæ 12-jointed, the twelfth segment about three times as long as the ten preceding ones. Thorax and scutellum pale yellow, the humeri greenish, stripes on mesonotum dark chestnut brown, pectum and metanotum fuscous. Abdomen fuscous, the first segment greenish yellow with a more or less distinct brown transverse fascia; segments 2, 3, and 4 with the apical third of each, yellow; fifth segment with a narrow yellow apical margin. Hypopygium as in *C. decorus* (see Pl. 32, fig. 13, Bul. 86, N. Y. State Museum), the superior forceps being strongly curved. Legs yellow, the fifth and the tips of the other tarsal joints and of the tibiæ brownish. The joints of the fore leg beginning with the femur bear the relations to each other as 41, 37, 58, 30, 23, 20, and 11. Fore tarsi without long hairs; pulvilli extend beyond the middle of the claws on all the feet. Wings hyaline, cross-vein brown, costa and R_{4+5} end together a short distance from the tip of the wing; cubitus forks under the proximal end of the cross-vein.

Female.—Like the male in color except that the paler margins of the abdominal segments are narrower and covered with a grayish bloom. The antennæ are 6-jointed, the fore metatarsus is slightly over 1.6 times the tibia in length, and the cubitus forks slightly distad of the proximal end of the cross-vein.

NOTES ON SOME NORTH AMERICAN SPECIES OF RHIZOPHAGUS (COL. NITID.).

By CHARLES SCHAEFFER,

BROOKLYN, N. Y.

Going over a few of our North American species of *Rhizophagus* at the request of Mr. A. Mécignon of Orleans, France, the following, mostly synonymical, notes were made.

Two new North American species are described by Mécignon which are unknown to me and the characters used in the new table given below are taken from the descriptions, those for *R. procerus* were kindly supplied by Colonel Casey.

TABLE OF THE NORTH AMERICAN SPECIES OF *Rhizophagus*.

1. Middle tibiæ at sides with three long spines at about apical half........2.
   Middle tibiæ without or with very small spines.......................3.
2. Front tibiæ with a rather long, acute spine above the apical tooth. *sayi* n. n.
   Front tibiæ without acute, long spine above the apical tooth. *cylindricus* Lec.
3. Third joint of antennæ as long as the following three combined. *parallelocollis* Gyll.
   Third joint of antennæ shorter than the following three combined......4.
4. Second elytral interval dilated and punctate at base.......*grouvellei* Méc.
   Second elytral interval not dilated nor punctate at base[1]................5.

[1] A few punctures are seen occasionally in some species but the interval is not dilated near base.

5. Antennæ apparently ten-pointed, the eleventh hidden in the tenth, the tenth truncate or subtruncate at apex; color brown, punctuation on thorax and elytra coarse.............*fenyesi* Méc., *brunneus* Horn.
   Antennæ distinctly eleven-jointed.................................6.
6. Prothorax elongate, as long or longer than wide.....................7.
   Prothorax short, wider than long.................................9.
7. Elytral intervals convex, striæ deeply impressed; prothorax exactly quadrate ....*procerus* Casey.
   Elytral intervals flat ....8.
8. Abdomen and upper surface alutaceous, elytral striæ more or less distinctly impressed; color generally piceous or brown......*scalpturatus* Mann.
   Abdomen and upper surface shining, elytral striæ not impressed, except the sutural or first and sometimes the second stria more or less distinctly; color piceous, elytra with narrow basal space and generally the apex reddish ....*dispar* Gyll.

9. Elytral epipleuræ distinctly punctured at base; prosternum and side pieces coarsely and moderately densely punctate.........*approximatus* Lec.
Elytral epipleura not punctured at base; prosternum and side pieces sparsely punctured ....10.

10. Elytra piceous, unicolored; form rather convex............*remotus* Lec.
Elytra piceous with two oblique reddish spots; form slightly depressed. *minutus* Mann.

Rhizophagus sayi n. n.

Rhizophagus bipunctatus Say.

Journ. Acad. Nat. Sciences Phil., Vol. III, p. 324.

The specific name is used in this genus by Herbst for a European species.

This species and *cylindricus* are the only ones in our fauna having the middle tibiæ armed with three rather long spines.

Rhizophagus parallelocollis Gyll.

Ins. svec., Vol. IV, p. 638.

Rhizophagus robustus Schaef.

Journ, N. Y. Ent. Soc., XIX, p. 118.

Mr. A. Mécignon suggested in a letter to me the possible synonymy of the above two species and kindly sent me this and other European species of *Rhizophagus*. Comparing a specimen of *R. parallelocollis* with my *R. robustus*, his surmise proved to be correct.

Rhizophagus grouvellei Méc.

Bull. Soc. ent. France, 1913, p. 91.

A recently described species, unknown to me. However, it will be readily known from our other North American species in having the second elytral interval dilated and punctate at base, which puts it with the European *R. depressus* Fab. in the subgenus *Eurhizophagus*.

Rhizophagus fenyesi Méc.

Bull. Soc. ent. France, 1913, p. 91.

This species, unknown to me, was recently described. From the description I was unable to find a good character to separate it from *R. brunnens*, with which it agrees in the apparently ten-jointed antennæ, coarse punctuation, etc.

Rhizophagus dispar Payk.

Faun. svec., III, 1800, p. 328.

Rhizophagus dimidiatus Mann.

Bull. Mosc., 1843, p. 300.

Among the European species of *Rhizophagus* sent me by Mr. A. Mécignon was a specimen of *R. dispar* which looked very familiar and proved to be the same as our *R. dimidiatus.*

MISCELLANEOUS NOTES.

Cicindela longilabris Say.—Typical specimens of this species have been taken by John Woodgate in the Jemez Mountains, New Mexico, at an altitude of 7,500–8,000 ft., distant ten miles from Jemez Springs, in June of this year. Of the seven specimens captured five are identical with the form familiar to us as found on our northeastern boundary. Two are immaculate, a little less metallic above, surface of elytra a little smoother, and of a darker brown color, nearly black. The capture is interesting as it places the type form several degrees farther south than it appears to have been reported. Jemez Springs is in latitude 30° 45′.—EDW. D. HARRIS.

Coscinoptera dominicana.—The adults of this species are not uncommon on a variety of trees in May, June and July. The cocoons have been found under stones and logs in the nests of the ant, *Formica schaufussi,* and adults have been bred from cocoons found at Newfoundland, N. J., April 27, 1907, beetle hatched about May 18, and Roselle Park, N. J., April 13, 1913, beetle hatched about May 15.—WM. T. DAVIS.

Chlænius leucoscelis.—This species has not been abundant near New York. Most of the specimens in local collections have been taken under stones by the Croton River by Mr. Wm. T. Davis, or near the same locality by Mr. C. L. Brownell; Mr. Chas. Schaeffer has also found it at Suffern. Mr. Davis collecting on the banks of the Potomac near the Great Falls, Va., found that a single individual which he pursued stayed under water nearly a minute.—C. W. LENG.

Lophoglossus.—The species of this genus prefer very wet places. Mr. Brownell dug a number of specimens out of a water-soaked log near Westwood, N. J., and Mr. E. A. Bischoff has found them clinging to the under side of logs in water, like water beetles.—C. W. LENG.

Ochthebius attritus.—Among the beetles collected in Florida by Dr. Frank E. Lutz, of the American Museum, are several specimens of this species which, he tells me, were found in a small body of water in a roadside ditch near Titusville. The water was still at the time (November 8, 1912) and 80° Fahrenheit, but evidently in slow motion at more rainy seasons. Dense vegetation clothed the soil at the bottom of the pool. Most of the specimens are testaceous in color with only a feeble metallic lustre; mixed with them were two specimens of *O. foveicollis,* readily separable by their dark green metallic color, as well as by the deep foveæ of the pronotum.—C. W. LENG.

Ceutorrhynchus hamiltoni Dietz.—Mr. Norman S. Easton has sent me specimens of this Curculionid beetle, collected in Newport Co., R. I., in July, on a beach plant identified by Mr. William T. Davis as *Cakile edentula.*—C. W. LENG.

Cicindela blanda Dej.—Prof. J. Chester Bradley has sent me specimens of this tiger beetle, collected July 28, at Groveland, Ga., on the Canouchee River. This is the type locality for *C. tarsalis* Lec., so that Professor Bradley's capture confirms the synonymy already published and the occurrence of *C. blanda* on the Atlantic as well the Gulf slope of Georgia.—C. W. LENG.

Cryptic coloration.—A pair of *Galasa rubidana* Walk. were observed in copula at Highland, N. Y., July 22, 1913. The pair were resting upon the upper surface of intact elder (*Sambucus*) foliage and presented such a close resemblance to a piece of brown, dead leaf held in place by irregular spider threads that we were thoroughly deceived for several moments. The moths were joined end to end and rested with their bodies a little out of a straight line. The coppery or purplish red forewings with their indistinct, lighter maculations were nearly horizontal to the supporting leaf. The deception was further increased by the light gray legs with their dark, white annulate tarsi which closely resembled, in a general way, an irregular series of dirty spider webs.—E. P. FELT.

Prionapteryx nebulifera.—This Pyralid occurs at Yaphank, Long Island, N. Y., where I found its silken, sand-grain-coated tubes, on small huckleberry bushes on May 30, 1911, and again on May 18, 1913. Previous records are from the southern states and the Pine Barrens of New Jersey.—WM. T. DAVIS.

A CORRECTION.

Line 5 from bottom on page 148 of the June number pertains to *Trichopodopsis* and not to *Trichiopoda*. It should read:

Type, *Musca* (*Dictya*) *pennipes* J. C. Fab.

Trichiopoda Latreille.

Synonyms, *Trichopoda* auct. pt. *Polistomyia* Townsend.

Parasitic in Acridiidæ (*Dissosteira*) so far as known. Deposits flat-oval macrotype eggs on host. Described in Tax. Musc. Flies (1908), pp. 132–133.

PROCEEDINGS OF THE NEW YORK ENTOMOLOGICAL SOCIETY.

MEETING OF MAY 20.

A regular meeting of the New York Entomological Society was held May 20, 1913, at 8:15 P. M., in the American Museum of Natural History, Vice-President Charles L. Pollard in the chair, with 27 members and two visitors present.

Mr. Schaeffer exhibited specimens and spoke on the North American species of the genus *Rhizophagus,* referring particularly to the holoarctic distribution of some species, leading to the discovery of some heretofore unsuspected synonymy, as in the case of the species he had described as *robustus* from Long Island, New Jersey and Kentucky, which is identical with the European *parallelocollis* and *dimidiatus* which is the same as the European *dispar*. Mr. Schaeffer described some of the characters employed which indicate specific differences, the dilation of the second stria near base, the apparently ten-jointed antennæ, the spines or teeth of the tibiæ, and the larger head of the male, especially noticeable in *cylindricus,* and referred to his correspondence with Colonel Casey, Mr. Chas. Liebeck and Mr. A. Méquignon, who has written on the European species and recently described *R. fenyesi* and *R. grouvellei* from the Pacific coast. He regretted that the description of a few species from unique examples cast some doubt on their validity and said

that the western *minutus* and eastern *remotus* were so far also separable only by feeble characters. The Atlantic coast species appear to be *parallelocollis*, *dispar*, and *remotus*.

The position of the genus in the classification was discussed by Messrs. Leng and Schaeffer, the former favoring a closer relation with the Monotomidæ.

Mr. Engelhardt exhibited Lepidoptera from Claremont, N. H., collected early in May, and spoke especially of the early character of the season, which seemed to be as far advanced in Claremont as here. Claremont is situated in the valley of the Sugar River, a tributary of the Connecticut, and possesses well kept streets shaded by elms and sugar maples, while nearby are forest clad hills reaching their climax in Ascutney Mountain, over 3,000 feet high. Repeated visits have been made by Messrs. Dow and Engelhardt during June, July and August and the present visit from May 1 to 4 was made principally to collect early Noctuids. A list of those captured is appended to these minutes. The collecting by day was confined to nearby groves of White Pine and Hemlock and by night to the electric lights with which Claremont is well provided. Photographs of the locality were exhibited.

Mr. Angell asked the derivation of the word butterfly, and received several answers. Mr. Dow said it dated back beyond the tenth century.

Mr. Schaeffer suggested it was analogus in origin to the word buttercup, and referred to the prevailing yellow coloration of common species of *Colias*.

Dr. Lutz confirmed this view as having been previously advanced, but called attention to another, referring to its excrement resembling butter; cf. O. D. boterschijte.

A paper by Mr. Harris, attached to these minutes, was read by the secretary in which he described the destruction of a tiger beetle in his cabinet by a Tineid moth, the larva of which lived within the beetle and pupated there, forcing the head away from the thorax, but not detaching it until the moth emerged.

The paper was discussed by several members; Mr. Davis said such attacks were not uncommon in collections of Noctuids, Mr. Roberts recalled a similar destruction of *Eacles imperialis*, Mr. Grossbeck added that there was an omnivorous moth, *Plodia interpunctella*, with which he had trouble before, a box of Lepidoptera going fast under its atacks, and he suspected Mr. Harris's visitor to be the same.

Mr. Bischoff exhibited a specimen of *Cicindela 6-guttata* with the white markings reduced to an apical dot taken at Upper Montclair, May 4.

Mr. Dickerson exhibited a plant of the naked broom rape (*Thalesia uniflora*) collected at Nutley, N. J., Mar. 18, with root lice (Rhizobiinæ) clustered about the roots and accompanied by specimens of the ant *Lasius latipes*—which he said was a usual combination in his experience, not only on this plant, but on Asters, when it became a pest for which the remedy was ground tobacco.

The exhibit was discussed by Messrs. Comstock, Olsen and Davis, the latter pointing out that some species of ants rarely come to surface, but care for the root lice from the egg stage up.

Mr. Dow spoke of *Tenebrioides dubius* occurring most commonly on apple, but also on cherry, hickory, oak, maple, chestnut, will and elm, and of *Psenocerus supernotatus* which he had hatched from twigs of *Rhus glabra.* Two males hatched first and fought, the larger chewing the antennæ off the smaller. Later a female hatched, and when observed had gone to housekeeping with the cripple.

Mr. Leng spoke of *Chlænius leucoscelis* and the species of *Lophoglossus* and their local distribution.

Mr. Angell spoke of the excellent collecting at Westwood, N. J., especially for water beetles and Carabidæ. The best locality was in a ditch cut for drainage purposes, four or five feet deep and about 200 feet from the Hackensack River and two miles northeast of the railroad station. There he had taken 50 species.

Mr. Sherman said he thought the ponds at Lakehurst, from which Mr. Roberts and he had taken 94 species in three days collecting, would still hold the record.

Mr. Comstock said the locality West Mount, given in Smith's List for some of Mr. Harvey J. Mitchell's records, was an error for Westwood.

Mr. Comstock spoke of his visit on April 26 to Old Bridge and Spotswood, where there was much yellow gravel and a modified pine barren region, and where he found five male *Anthocharis genutia* and the food plant of the species *Arabis lyrata.*

Mr. Roberts said he had collected this species in the "Texas" section of Spotswood, practically the same locality, 25 years ago.

Mr. Davis exhibited in Riker mounts, small huckleberry bushes with the silken sand grain covered tubes of *Prionapteryx nebulifera* attached, which he had collected at Yaphank, May 18, 1913. The tubes were about four inches long and thicker than a lead pencil and led from an enlarged underground chamber, where the larva was to be found, to the foliage. Among the records for the species are Florida, Texas and Pine Barrens of New Jersey, so that this Yaphank record extends the known range considerably northward.

Mr. Davis also exhibited a living specimen of *Coscinoptera dominicana,* with the cocoon from which it had recently emerged and a still unopened cocoon, both collected at Roselle Park, N. J., on April 13, in a nest of *Formica schaufussi* under a log. The adults of this species are found from May to July on the foliage of various plants, sumach (Chittenden), sourgum, oak and wild grape (Blatchley), *Quercus nana* (Davis at Yaphank, May 18); cocoons have been found at Newfoundland, N. J., under stones, with *Formica schaufussi* as in the Roselle Park instance and emerged May 18. Professor Wheeler also mentions finding the cocoons at Bronxville, N. Y., April 19, 1908.

Dr. Lutz, reverting to the discussion on environment, quoted a passage from Tutt's "Melanism and Melanochroism" in which it was pointed out that "food had nothing to do with the peculiarity of the Rannoch fauna (of Scotland) or in a wider sense, the Alpine fauna," the general deduction of the author being that the phenomena to which his book is devoted are correlated with conditions of moisture.

Mr. Engelhardt placed on record the capture on April 27 on Hempstead plains, of *Graphiphora garmani,* previously known from Illinois and northwestern regions, except for specimens caught at east New York by Mr. Shoemaker.

Mr. Engelhardt also exhibited a moth caught at Central Park, Long Island, which thus far has not been identified with any known species of genus.

Mr. Grossbeck exhibited as a monstrosity, a specimen of *Heterocampa inornata,* which came to light in Florida, in which the head of the larva is attached to the head of the moth.

Mr. Wintersteiner placed on record the capture of two specimens of *Cercyon littoralis* at Stony Point in September.

On motion it was voted to omit the June meetings.

MEETING OF OCTOBER 7.

A regular meeting of the New York Entomological Society was held October 7, 1913, at 8:15 P. M., in the American Museum of Natural History. President Dr. Raymond C. Osburn in the chair, and sixteen members and three visitors present.

The President read letters of Mrs. Annie Trumbull Slosson and Morris K. Jesup dated in December, 1892, asking and granting permission for the Society to hold its meetings in the American Museum, which letters had been forwarded to him by Mr. Beutenmuller.

Mr. Schaeffer, as the only member in continuous attendance during the intervening twenty-one years, recalled the meetings held previous to December, 1892, at the residences of various members, and in the German American School on Madison Avenue, where Mr. Harris also recalled being present as a visitor.

Mr. deVyver read a report of the Jubilee meeting of the Entomological Society of Ontario, August 27 to 29, which he attended with Dr. Felt, as delegate from this Society.

Mr. Davis reported briefly on his visit to Florida in September, during which he made collections at Jacksonville, Titusville, Miami, Cocoanut Grove, Big Pine Key and Key West. At Titusville he was fortunate in securing quarters at LaGrange, about three miles from the station amid congenial surroundings, and at Big Pine Key also, with the Sands family. Many West Indian insects were found there and on the gumbo limbo trees at Key West. Mr. Davis exhibited a living *Conocephalus mexicanus fuscostriatus* found at night by the use of the lantern, and the skin it was shedding when caught. He commented on the sharp little pads of wings. He also spoke of the large number of cicadas obtained by the use of a gun loaded with mustard shot.

Mr. Sleight, who accompanied Mr. Davis, brought out the hardships of the journey, due to the large number of mosquitos and red bugs encountered. The latter were found the first day at Jacksonville and continued throughout the journey to be very annoying, while the mosquitos were so abundant at Big Pine Key that even Mr. Davis was forced to run on one occasion.

Mr. Leng spoke of his visit to Cuba with Dr. Lutz, who was still on the island, explaining the necessity of some acquaintance with its fauna in dealing with that of Florida. Up to the time of his return, Cabanas and Esperanza on the north coast had been visited to compare their mangrove swamps and beaches with those of Florida; the pine woods at Llanada, seven or eight miles south of Pinar del Rio, for similar comparison with the pine fauna of Florida; and the more mountainous region near Vinales for general collecting. Mr. Leng said the material gathered and the collections of Gundlach and Poey would need careful study before any definite comparison could be made, but it was already evident that striking resemblances mixed with equally striking contrasts would be the result, especially in the western part of Cuba. He also spoke of the kindness of Dr. Britton, of the Botanical Garden, in indicating the places where Floridian trees would be found, and of Dr. Carlos de la Torre, of Havana.

Mr. Barber said he had spent July and August at Vienna, Va., near Washington, and in constant communication with Mr. McAtee and other Washington entomologists, visiting Plum Point, Plummer's Island and other places of interest, incidentally adding four species of Hemiptera to the Plummer's Island list.

Mr. Sherman had also visited Vienna from September 15 to 25.

Mr. Pollard spoke briefly of his trip to Twin Lakes, Conn., with Mr. J. W. Angell.

Dr. Forbes said he had devoted some time during the past summer to dissections of the muscular system of caterpillars, following the neglected work in 1760 of Leone, of The Hague.

Mr. Shoemaker said he also had yielded to the lure of Washington, where he spent eleven days in June and the same again in September.

Mr. Dow said that editorial duties had consumed the greater part of his time, bringing him into contact with entomologists rather than insects. He gave the members news and messages from Colonel Casey, Professor Fall, Dr. van Dyke, Carl Fuchs, Dr. Fenyes, Dr. Walther Horn, Mr. Bowditch and others.

Mr. Hall spoke of his endeavor to obtain a complete representation of the variations of *Satyrus alope*, and visits made in that connection to Long Island, New Jersey, Adirondacks, White Mountains, Maine, etc. He also exhibited *Erebus odora* from Sussex Co., N. J.

Mr. Engelhardt described his three weeks visit to Stowe, Vt., and the summit of Mt. Mansfield in June. He said the situation was most agreeable and the catch of Lepidoptera by the use of acetylene light at night quite extraordinary, 1,500 specimens having been caught in twelve nights. The Labrador Tea was plentiful on the summit, and he had, therefore, hopes of duplicating some of the captures made the year before in Labrador and Newfoundland, but the collecting was not good on account of the high winds prevailing, and his collecting was done in the valley. A remarkable feature also was the abundance of *Malachius æneus* of which 100 specimens were

taken by sweeping meadow grasses. Dr. Forbes confirmed the effect of high winds by his own experiences.

Mr. Harris spoke of his visit to Asheville, N. C., in May, where he obtained a fine series of *Cicindela splendida,* but failed to find *C. patruela* and *C. unipunctata.*

In the valley of the French Broad he observed numbers of hellgrammites crawling on the moist sand, which Mr. Davis said were probably leaving the water to transform.

Mr. Harris also spoke of his visit to Callicoon, on the Delaware River, with Mr. Davis and Mr. Leng, to obtain *Cicindela marginipennis* at the locality visited by Schaupp about forty years ago, and of his unpleasant experiences with an irate farmer.

Mr. Schaeffer spoke of his own work on Long Island during the year, and of the excellent work of Mr. Nicolay, of the Brooklyn Society.

On invitation, Mr. Nicolay described the localities at Bellport and Wading River, his captures of *Carabus sylvosus, Calosoma wilcoxi* and *frigidum, Temnochila virescens* and other interesting species. *Clerus ichneumoneus* was found running actively up and down a telegraph pole while *Sandalus niger* was collected on the Palisades on the instalment plan, portions of two dead specimens being patched to make one perfect specimen.

INDEX TO NAMES OF INSECTS AND PLANTS IN VOLUME XXI.

Generic names begin with a capital, specific names with a small letter. New genera, subgenera, species, subspecies, varieties and *nomina nova* are printed in italics.